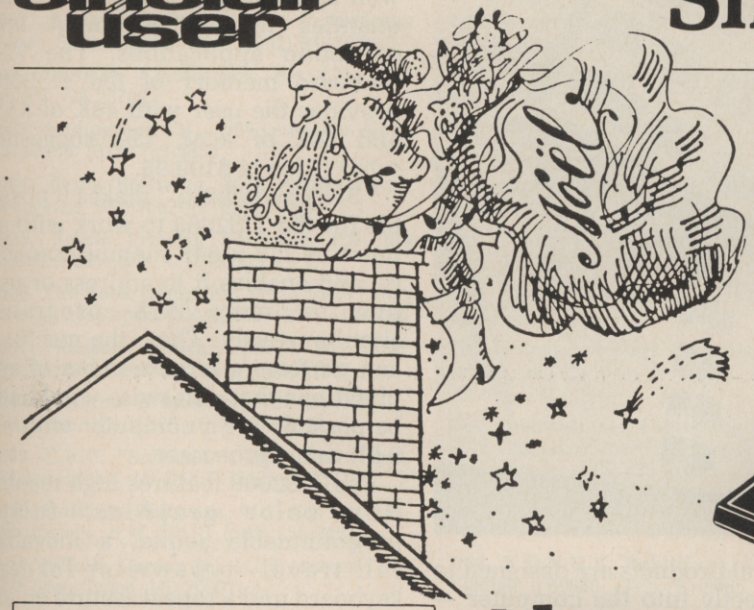
timex sinclair user

Shopper's Guide



An up-to-the minute compendium of products available for Timex Sinclair computers

How To Use This Guide

WELCOME to Timex Sinclair User's Shopper's Guide, in which we list much of the software, hardware, books and other items available for use with the ZX81, T/S1000, T/S1500 and T/S2068 computers. The listings are straightforward and there are just a few things you should know before you begin.

Each entry begins with the name of a product **in boldface type,** followed by a description, price information, and at least one three-digit number in parenthesis. These numbers refer to suppliers, who are listed numerically on page SG3.

Though Timex Sinclair User has endeavored to make this guide as accurate as possible, it is not meant to be a catalog, and readers should confirm price and availability of items with suppliers before ordering.

Happy browsing!

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About T/S Computers . . .

A FULLY programmable personal computer with black-and-white grapics capability, the Timex Sinclair 1000 is a computer literacy learning tool which provides the first-time user with a low cost introduction to computers. The T/S1000 is compact, lightweight and compatible with a wide range of peripherals, as well as hundreds of software packages for educational, household management, entertainment and business applications. It has a suggested retail price of $49.95.

The Timex Sinclair 1000 has an expandable 2K byte internal memory, and comes complete with all necessary attachments including a step-by-step instruction manual, custom-written for the first-time computer user. The instruction book includes a course in fundamental programming enabling users to develop custom programs in BASIC one of the standard languages of personal computers.

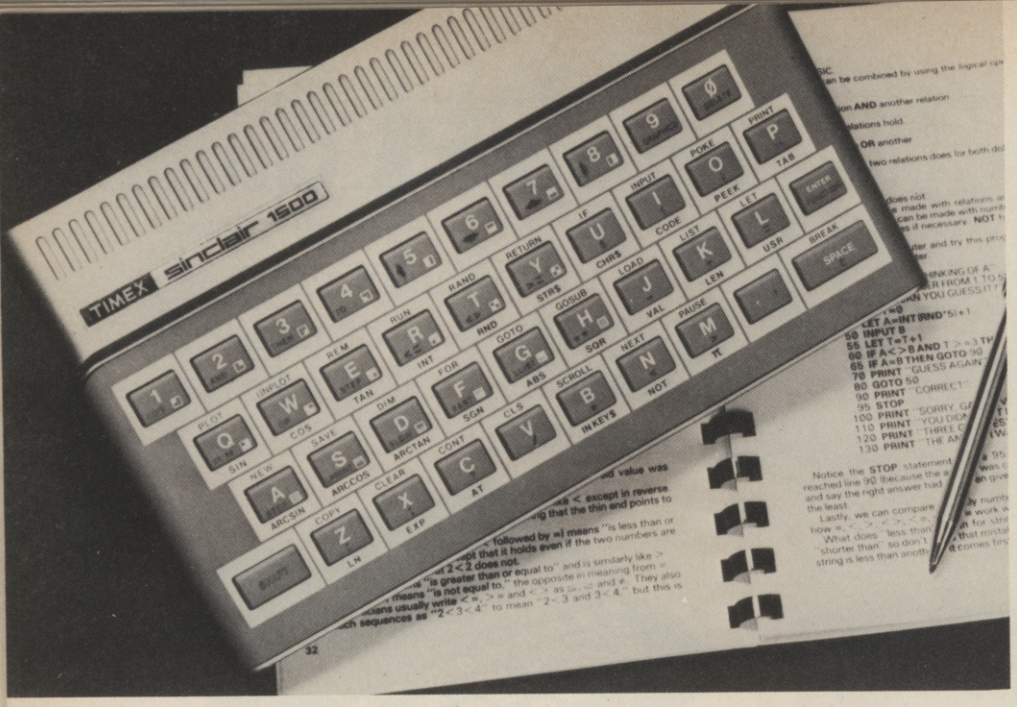
The 2K RAM can be expanded to 16K with the addition of memory expansion modules like the T/S1016. This optional unit allows users to extend the computer's memory for program storage, or use as a data base.

A 32-column thermal printer is also available for use with the T/S1000, as well as other Timex Sinclair personal computers. The Timex Sinclair 2040 thermal printer incorporates a dot-matrix print mechanism with full graphics and text capability and operates at a speed of two lines per second. Graphics and text capability are available in two different modes: full-screen printing with a single-key copy command, as well as a program-controlled printing mode which allows custom control of the printing format.

Communication with data banks and telecommunications services will be possible with the T/S1000 through the use of a communications interface device, or modem, which Timex has announced it will soon introduce.

The T/S1000 is packaged complete with all power, television and cassette recorder cables. In addition, all Timex peripheral products are designed to plug directly into the computer — an advantage over other computers which require the purchase of separate components before peripheral products can be used.

All Timex computer products are backed by a 90-day limited warran-



ty, and a toll-free consumer hotline (1-800-24TIMEX) is available to help with consumer inquiries.

T/S1500

The Timex Sinclair 1500, the first 16K personal computer with a suggested retail price of under $80, is fully programmable, with black-and-white graphics capability and an expandable memory. It features a movable typewriter format keyboard and use of either standard audio cassette or unique solid state mini-cartridge software. It has a suggested retail price of $79.95.

The T/S1500 features a 16K RAM that can be expanded to 32K. The programming language is extended BASIC. A unique syntax check report codes allow users to instantly identify and correct programming errors. The graphic display area of the T/S1500 can be controlled by plot and unplot graphic commands in addition to the 22 pre-defined graphic characters.

The multi-function keyboard of the T/S1500 has 40 full-movement, typewriter-format keys with 22 graphic characters and 22 special characters. The keyboard also features Timex's unique "one touch" key-word entry, which enables each key to perform as many as six possible functions, thus reducing a great deal of input typing.

The T/S1500 is compatible with all of the peripherals and software available for the T/S1000, including the T/S1016 Memory Expansion Module and the T/S2040 Thermal Printer. In addition, all Timex peripheral products are designed to plug directly into the computer — an advantage over many other computers which require the purchase of separate expansion boxes before peripheral products can be used.

Communication with data banks and telecommunication services will be possible with the T/S1500 through the use of a communications interface device, or modem. Timex also plans to introduce special programs which will allow users to develop home shopping and banking capabilities through the use of the modem.

The T/S1500 is packaged complete with all power, television and cassette recorder cables, and comprehensive, step-by-step instruction manual.

T/S2068

The Timex Sinclair 2068 color personal computer features a 72K internal memory capacity allowing word processing capabilities as well as enhanced color and sound qualities for entertainment and education applications. The 72K on-board memory of the T/S2068 provides the user with 48K of RAM and 24K of ROM. The suggested retail price is $199.95.

"Bank switching," makes it possible for the T/S2068 to work with as much as 256 × 64K memory capacity, and enables it to address or use one or more 64K programs simultaneously. Thus, the machine can perform a large number of applications that otherwise would not be possible for a computer with an 8-bit microprocessor.

The T/S2068 features high resolution color graphics, fully-programmable sound, a movable full-travel typewriter-format keyboard and a repeat feature on all 42 keys. It has upper and lower case letters, 16 built-in graphics characters and an additional 21 graphics characters which can be programmed by the user.

Video display for the T/S2068 can be achieved through the use of a monitor and/or most black-and-white or color television sets. Another standard feature of the T/S2068 is a built-in real time clock.

The programming language of the T/S2068 is Sinclair extended BASIC. "Soft touch" key-word entry commands allow each key to perform up to six possible functions, and an exclusive syntax check-and-repeat code permits the user to identify the correct mistakes instantly — greatly simplifying procedures and increasing the amount of accessible memory.

Suppliers

001. Arizoftx Software, 6501 E. Monterosa Street, Scottsdale, AZ 85251. (602) 949-0494

002. Artisan Electronics, Box 631, Portsmouth, VA 23703.

003. Audiograph Co., 3584 Leroy, Ann Arbor, MI 48103. (313) 769-6859

004. Banta Software, 8088 Highwood Way, Orangevale, CA 95662. (916) 722-4895

005. Bomis Prendin Software, P.O. Box 28550, Washington, D.C. 20005.

006. The Book Company, 11223 South Hindry Avenue, Los Angeles, CA 90045. (213) 410-9466

007. Russell Brewer, 26630 Mill Road, Frazeysburg, OH 43822. (614) 668-2700

008. E. Arthur Brown Co., 1702 Oak Knoll Dr., Alexandria, MN 56308. (612) 762-8847

009. C.R.C. *Software*, 2901 Auburn Road, Auburn Heights, MI 48057. (313) 852-3711

010. Calliope Software, 4130 Coe Dr. N.E., Albuquerque, N.M. 87110. (505) 256-9457

011. John B. Carson Jr., 11200 Lockwood Dr., 307 Silver Spring, MD 20901.

012. Christian Software, Box 547, Stat RT 590, Bettsville, Ohio 44815. (419) 986-5217

013. J. W. Collins, 6025 Hampstead Drive W., Columbus, OH 43229.

014. Compucraft, Box 149, Hinsdale, NH 03451. (814) 238-2744

015. Compusa Corp., 1101 Bristol Road, Mountainside, NJ 07092. (201) 654-7220

016. CompuSoft Publishing, 535 Broadway, El Cajon, CA 92021. Information: (610) 588-0996. Orders: (800) 854-6505

017. Computronics, p.o. Box 117, Okemos, MI 48864. (517) 349-9842

018. Cottage Technology, 5720 W. Little York Suite 178, Houston, TX 77091.

019. Crosscurrents, 417 Clinton St., Brooklyn, NY 11231. (212) 855-6284

020. DRRP Software, P.O. Box 3664, Peabody, MA 01960.

021. R. T. Darin Enterprises, Inc., 451 Center St., Lewiston, NY 14092. (716) 754-7106

022. A. Doty, P.O. Box 11023, Ferguson, MO 63135.

023. Down East Computers, P.O. Box 3096, Greenville, NC 27834. (919) 752-7817

024. Charles Drury, 40 Westgate #5, Chestnut Hill, MA 02135.

025. E and S Software, P.O. Box 196, Budd Lake, NJ 07828. 691-8381

026. Ener-Z Co., P.O. Box 635, Ft. Washington, PA 19034. (215) 674-4828

027. Executive Workshop, 7420 S.E. Woodstock Blvd., Portland, OR 97206. (513) 771-8564

029. Florida Creations, P.O. Box 16422, Jacksonville, FL 32245. (305) 631-5568

028. Evan Soft Associates, 1246 Elmwood, Evanston, IL 60202. (312) 864-2765

030. Friendly Computer, P.O. Box 122, Wallingford, PA 19086. (215) 876-8717

031. Ganhart/Earthings, 115 N. Rocky River Dr., Berea, Ohio 44017. (216) 234-2662

032. Gladstone Electronics, Inc., 1585 Kenmore Ave., Buffalo, NY 14217.
(716) 874-5510 (800) 833-8400

033. Graphicomp, 55 York St., Suite 100, Toronto, Ontario, M5J 1R7, Canada. (416) 363-6460

034. Wayne Green Books, Peterborough, NH 03458. (603) 924-9471

035. Walter Gundy, RT 2, Box 798B, Harrisonville, MI 64701.

036. Heath Computer Services, 950 East 52 South, Greentown, IN 46936. (317) 628-3130

037. Horizon Simulation, 789 S. GreenBay Road, Lake Forest, IL 60045.

038. Hunter Electronics, 1630 Forest Hills Drive, Okemos, MI 48864. (517) 349-5650

039. I.M.S. Enterprises, P.O. Box 4503, Lancaster, CA 93539.

040. Integrated Data Systems, 11 Brighton Avenue, Toronto, Ont., M4M 1P3, Canada. (416) 466-5571

041. International Publishing & Software, 3948 Chesswood Drive, Downsview, Ontario, M3T 2W6, Canada. (416) 636-9409

042. JPR Software, Inc., P.O. Box 4155, Winter Park, FL 32793. (315) 646-9125

043. K.D.V.H.E. Publishers, P.O. Box 6788, Chicago, Il 60680. (312) 791-9065

044. Katt's Computers, Box 162, Chicago, IL.

045. Ksoft Co., 845 Wellner Rd., Naperville, IL 60540. (312) 961-1250

046. L-Monitor, 819 Kenyon Lane, Newark, DE 19711. (302) 368-3472

047. L&G Enterprises, Box 6854, Silver Spring, MD 20906. (301) 774-0126

048. Lamb's Software, 1469 Aalborg Way, Solvang, CA 93463.

049. Lipinski Software, 2737 Susquehanna Road, Roslyn, PA 19001. (215) 572-6812

050. Mac Man Software, 515 W. 236 St., Bronx, NY 10463.

051. Mallas Software, 147 St. Johns Rd., Weirton, W. VA 26062.

052. Markel Software, P.O. Box 2392, Secaucus, NJ 07094-0992.

053. M.H. Marks Enterprises, 315 Thornberry Cort, Pittsburgh, PA 15237. (412) 486-1694

054. William Don Maples, 688 Moore St., Dept. S, Lakewood, CO 80215.

055. Memotech, 7550 W. Yale Avenue, Denver, CO 80227. (303) 986-1516

056. Micor-80 Inc., 2665 N. Busby Road, Oak Harbor, WA 98277.
Inquiries: (216) 675-6143
Orders: (800) 553-0035

057. Robert J. Midura, 19 Merrifield St., Worester, MA 01605.

058. Mill Research, 32749 Avalon Cres., Abbotsford, B.C., V2T 3W9, Canada.

059. Robert C. Moler, 5999 Secor Rd., Traverse City, MI 49684. (616) 946-8649

060. McKelvie Programs, P.O. Box 53076, Philadelphia, PA 19105.

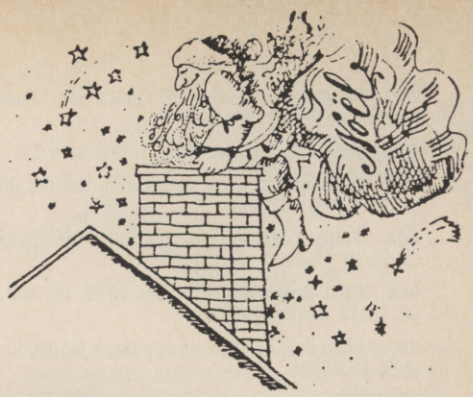
061. Bob Norman, 12817 Pinecrest Rd., Herndon, VA 22071.

062. Orbyte Software, P.O. Box 948, Waterbury, CT 06720. (203) 753-8308

063. R. Panwar, 2035 Kentland Dr., Houston, TX 77067. (713) 537-8453

064. Peak, P.O. Box 8005, Suite 231, Boulder, CO 80306-8005.

065. Practical Computer Products, 21111 Strathmoor Lane, Huntington Beach, CA 92646.



066. Professional Electronics, 109 Chesney, Lane, Columbia, SC 29209.

067. Que Corporation, 7969 Castleway Drive, Indianapolis, IN 46250. (317) 842-7162

068. Quest Research Associates, P.O. Box 3073, San Jose, CA 95156.

069. RCO Technical, P.O. Box 773, St. Ann, MO 63074.

070. Ramstrap, 104 Ridgeway Ave., Louisville, Kentucky 40207. (502) 896-0901

071. Random Access, Box 41770T, Phoenix, AZ 85080.

072. Rave Research, 1005 Mechanic Street, Decorah, Iowa 52101. (319) 382-8383

073. Research in Speech Technology Inc. (R.I.S.T.), P.O. Box 499, Ft. Hamilton Station, Brooklyn, NY 11209. (212) 259-4934

074. Reston Computer Group, Reston Publishing Co., 11480 Sunset Hills Rd., Reston, VA 22090. (703) 437-5207

075. G. Russell Electronics, Rd #1, Box 539, Centrehall, PA 16828.

076. Savage Software, P.O. Box 441, Titusville, FL 32780. (305) 267-2893

077. Scientific Software, 6 W. 61 Terrace, Kansas City, MO 64113.

078. M. Sieder, 5710 Blvd., Milan, Brossard, QUE., J4Z 2A9, Canada. (514) 678-3772

079. Simulusion, Box 894, Lemon Grove, CA 92045.

080. Sinclair Research Limited, One Sinclair Plaza, Nashua, NH 03061.
Order: (800) 543-3000, Operator #509.

081. Soft Magic Corp., 1210 W. High St., Bryan, OH 43506. (419) 636-4531

082. Softsync, Inc., 14 East 34th Street, New York, NY 10016. (212) 685-2080

083. Software Development Associates, 3328 W. Las Palmaistas Dr., Dept. T., Phoenix, AX 85021.

084. Soft-Way, 3308 Midway Dr. #124, San Diego, CA 92110.

085. Strategem Cybernetics, Inc., 286 Corbin Place, Brooklyn, NY 11234. (212) 934-3729

086. Suntronics Co., Ltd., 12621 Crenshaw Blvd., Hawthorne, CA 90250. (213) 644-1149

087. Syber Incorporated, P.O. Box 972, Ocean Springs, MS 39564.
(601) 875-3682 (601) 875-3445

088. Sybex, 2344 Sixth Street, Berkeley, CA 94710.
(415) 848-8233 Telex: 336311

089. Synchronizing Education and Games, 668 Sherene Terrace, London, Ontario, N6H 3K1, Canada.

090. Syncware Co., P.O. Box 5177, El Monte, CA 91734.

091. THM Software, 154 Laconia Avenue, Staten Island, NY 10305.

092. Teletek Company, 15 Central Way, Suite 169, Kirkland, WA 98033.

093. Timex Computer Corp., Waterbury C T

3G Company Inc., RT. 3 Box 28A, Gaston, OR 97229. (503) 662-4492

095. Toco Technology, P.O. Box 98, Santa Claus, IN 47579.

096. 2-Bit Software, P.O. Box 2036, Del Mar, CA 92014. (619) 481-3629

097. UAS, P.O. Box 612, Haddonfield, NJ 08033. (609) 667-3328

098. Vidiom, P.O. Box 3118, Providence, RI 02906. (401) 861-0085

099. Michael B. Williams (Williamware), 1300 DePaul Way, Virginia Beach, VA 23464. (809) 420-3308

100. Thomas B. Woods, P.O. Box 64, Jefferson, NH 03583. (603) 586-7734

101. Apropos Technology, 350 N. Lantana Ave., Suite 821, Camarillo, CA 93010. (805) 482-3604

102. Barlog Software, 401 N. Geyer Rd., Kirkwood, MO 63122. (314) 821-2584

103. Birkhauser Bodton Inc., 380 Green Street, Cambridge, MA 02139. (617) 876-2335

104. Bytesize Micro Technology, P.O. Box 12309, Dept. HCD, Seattle, WA. (206) 236-BYTE

105. Cinagro Software, 155 Seventh Street, Rochester, NY 14609.

106. Computer-Wear Software, P.O. Box 1059, Riverdale, NY 10471. (212) 543-1935

107. Creative Computing Press, Dept. ND4H, 39 East Hanover Ave., Morris Plains, NJ 07950. (800) 631-8112

108. E-Z Key, Suite 75, 711 Southern Artery, Quincy, MA 02169. (617) 773-1187

109. P. Hargrave, Site V, RR4, Nanaimo, BC, Canada, V9R 5X9. (604) 245-8141

110. Kaltek Co., Box 7462, Rochester, NY 14615.

111. Kopak, Inc., 119 Peter Street, Union City, NJ 07087. (201) 864-4410
OR P.O. Box 1076, New York, NY 10019. (800) 222-0903 Toll Free

112. Orion's Belt Enterprises, 807 N. Fairway Rd., Glenside, PA 19038. (215) 572-6690

113. Signature Software, P.O. Box 13C, Blanca, CO 81121.

114. Syncmaster, Box 511, Oak Ridge, NC 27310. (919) 643-7120

115. Upstate Labs, 27 Elva St., Rochester, NY 14606.

116. Mary Williams, 2935 Market, East St. Louis, IL.

117. ZX-Panding Ltd., P.O. Box 25, Newton, NC 28658. (704) 464-2742

Software

Education

General

Countdown/300 (16K) Quiz-game format. Enter your own questions. $11.90 (040)

Countdown Series (16K) Answer 10 questions from a series of 20. 3 skill levels. $11.90 (040)

Cyborg Wars (16K) Simulation game illustrates concepts of balance of power, diminishing returns, resource management and others. High school to college. $14.00 (085)

Edupak (16K) Eight programs. Menu-driven. Teaches and quizzes the user on reading comprehension, vocabulary, spelling and grammar. Includes the games Super Number Guesser and Fortune Teller. $24.95 (111)

Edventure 1 (16K) Problems, puzzles & games for kindergarten to grade 3. $11.70 (040)

Edventure 2 (16K) Problems, puzzles & games. Oriented toward increase of speed. Grades 4-6. $11.70 (040)

Edventure 3 (16K) Problem-solving. Emphasis on speed. Grades 7-9. $11.70 (040)

Edventure 4 (16K) (Printer Optional) Develop insight, knowledge & problem-solving skills. Grades 10-12. $11.70 (040)

Flashcard (16K) Memory aid and testing. Random or non-repeating. User can program material to be tested. All ages. $11.95 (032)

Four 16K Programs Math Tutor has five levels. TYPING SKILLS sets you against the computer at your selection of typing speed. BIRDS swoop to attack. Intercept them with missiles. ASTRO SMASHER is a fast MC game. Dodge asteroids as you try to smash all the enemy ships. $12.50 (109)

Games Sampler (2K) Four introductory games. Hand-eye coordination and computer literacy promoted. Ages 6 & up. $14.95 (096)

Hangperson/100 (16K) User inserts own clues, subject and target. $11.90 (040)

Making Treks (2K) Four adventures featuring different geographical settings. Age 10 and up. $14.95 (096)

Mind Vs. Machine (2K) Emphasizes logic in four game formats. Ages 10 & up. $14.95 (096)

1,2,3 GO (2K) Game format. Learn basic computer skills plus counting, spelling, the alphabet and left and right. Ages 4-8. $14.95 (096)

Power Pak 1 (2K) Contains a calculator, bar graph generator, banner, and a polynomial equation grapher. $9.95 (080)

Presidents (16K) Quizzing on the presidents and their terms of office. $10.95 (080)

Punctuation Master (16K) Teaches the basic rules of punctuation using periods, question marks and commas. Practice exercises with a timed test. $10.95 (080)

Quiz All (16K) Timed quizzes of general knowledge, reasoning, English & maths. $11.90 (040)

Signals & Morse Code (16K) Learn and practise and test Semaphore, Blinker Lights and Morse Code. Graphics and audio. Messages can be inserted by user. $14.95 (032)

16 1K Programs (1K) Game format, plus tips on using the T/S1000 in education. $8.00 (089)

Statehood Quiz (16K) Three quiz programs relating to all 50 states. Questions on capitals, birds, mottos & more. All ages. $12.95 (083)

States and Capitals (16K) Three options of review: name the capital of the state given, name the states for the capitals or a random combination of the above. $12.95 (080)

Superdoodles (16K) Drawing program has a fast and slow "pen". $9.95 (080)

The Flight Simulator (16K) With full controls, instrumentation and a view of the horizon. Use the radio beams & radio compass to navigate. Avoid hazards near the landing field. Promotes an understanding of air flight. $19.95 (080)

Tutor (16K) (Printer Optional) User enters text and/or questions in true-false, multiple choice or direct answer formats. Readable screen inputs optional. $10.00 (also on T/S2068) (049)

Languages

Conversational French (16K) Teaches the basic useful words and phrases of the French language. Over 240 words and 50 phrases. $10.95 (080)

Conversational German (16K) Teaches basic useful words and phrases of German. Over 240 words and 50 phrases available. $10.95 (080)

Conversational Spanish (16K) Teaches the basic useful words of Spanish. Over 240 words and 50 phrases. $10.95 (080)

Countdown/302 Similies (16K) 10-question quizzes. 3 skill levels. Ages 9-16. $11.90 (040)

Countdown/304 French Review (16K) Tests verbs, nouns & adjectives in 10-question quiz format. Suitable to end of first year of study. $11.90 (040)

Der Student (16K) Review elementary vocabulary & grammar of German. 18 lessons. High school through college. $24.95 + p&h (013)

Hebrew Tutor I (16K) Learn Hebrew alphabet, vocabulary, & pronunciation. Game format. 60 words. One to 10 players. Beginners. $7.50 (020)

Highschool French (N/A USA) (16K) Teach and test verbs, pronouns, adjectives. Vocabulary of words and common expressions. $11.90 (040)

Intermediate English 1 (N/A USA) (16K) Game format. Drills meanings, parts of speech, similies and anagrams. $11.90 (040)

Intermediate English 2 (N/A USA) (16K) Game format. Drills definitions, parts of speech, similies, anagrams, idioms, opposites, spelling and "odd word out". $11.90 (040)

Language Usage (16K) For grades four through 12. Designed to help improve scores on standardized achievement tests. Records on work done, helps identify troublesome areas. $9.95 (080)

Math

Addition (1K) Listing. Drill for children. $1.00 (040)

Algebra (16K) User enters up to 20 formulae; computer solves using input data. Includes "Electronic pac" — solves electronics calculations. $14.95 (084)

Algebra I (2K) Find the greatest common denominator, solve the roots of a quadratic equation and linear equations in up to 10 unknowns. $10.95 (080)

Algebra II (2K) Performs functions on matrices. Finds the number of combinations or permutations of a set. $10.95 (080)

Angles 201 (16K) Practise using a protractor (not included). $11.90 (040)

Bell Curve Generator (1K) Listing. Generates a normal frequency curve. $1.00 (040)

Cayley's Sextant (1K) Listing. $1.00 (040)

Course In Hypercube Theory (16K) Listing. $4.76 (040)

Countdown/301 (16K) Multiplication tables. Quizzes of 10 questions. 3 skill levels. Any age. $11.90 (040)

Division Primer (16K) Defines and explains division. Test problems given. 2-7 years. $9.95 (050)

Doobarry Domino The Counting Phenameno (16K) For pre-schoolers. Graphics, music help them learn the numbers 1 to 10. $9.95 (080)

Easy Math (16K) (Printer Optional) Calculator format: type in equations, the computer does the rest. Produces columnar output. Demo program included. $9.95 (079)

Fundamentals Of Math (16K) For grades 1 through 8. A progressive series of drill, practice, and review sessions. Graded. 80% score promotes the student to the next level. Up to 8 levels. Answers corrected. $9.95 (080)

Geometry (16K) Menu of 21 shapes. Prompts for data, displays areas, volumes, perimeters & circumferences for 2- and 3-dimensional figures. $14.95 (084)

Geometry 1 (2K) Find the area of a polygon. Solve the unknown given 3 parts of a triangle. Convert radians to degrees and back. $10.95 (080)

Graphic Trig (16K) Plots data, scales display and does rectangular to polar conversion. $5.95 (084)

Graphs 202 (16K) Plots any X or Y function over range of user-defined values. High school level. $11.90 (040)

Hamilton Display (16K) Listing. Generates and displays Hamilton paths on a forgetful functional representation of a 4-dimensional cube. $1.90 (040)

Hamilton Path Generator (2K) Listing. Generates paths along edges through each corner once on hypercubes. $1.00 (040)

Hyperbolic Spiral (1K) Listing. $1.00 (040)

Hypocycloids (1K) Listing. $1.00 (040)

Intermediate Maths 1 (N/A USA) (16K) Multiplication, division, highest common factor, lowest common multiple, functions with fractions. $11.90 (040)

Intermediate Maths 2 (N/A USA) (16K) Multiplication, division, highest common factor, lowest common multiple, functions with fractions, areas, perimeters, simple equations, percentages, sets & Venn diagrams. $11.90 (040)

Jogmath (16K) (Printer Optional) Basic math skills. Simulated race against the computer or another person. Selectable number range and time allowed for answers. "Joggers" answer questions to complete the race. From Kindergarten to grade 7. $12.75 + $1.25 p&h (117)

Lissajous Figures (1K) Listing. $1.40 (040)

Long Division (1K) Listing. Over 475 decimal places. $1.80 (040)

Make Math (1K) Learn mathematical concepts by application of patterns and rules. Analogy with repeating decimals. Listing. $2.90 (040)

Math Facts Lab (16K or 64K) A drill program for addition, multiplication, subtraction, division. Program grades responses, displays answers. Guide included. For grades 1-6. $19.95 + $2 p&h (001)

Math 1 (16K) Two tapes, 16 lessons & games. Addition, Subtraction, Multiplication & Division for ages 6-8. Includes workbook & guide for parent/teacher. $24.95 (032) $29.95 (074)

Math 2 (16K) Two tapes. 16 lessons & games. Addition, Subtraction, Multiplication & Division for ages 7-9. Includes workbook & parent/teacher guide. $24.95 (032) $29.95 (074)

Math 3 (16K) Two tapes, 16 lessons & games. Addition, Subtraction, Multiplication & Division for ages 8-10. Includes workbook & parent/teacher guide. $24.95 (032) $29.95 (074)

Math 4 (16K) Two tapes, 16 lessons & games. Addition, Subtraction, Multiplication & Division for ages 9-11. Includes workbook & parent/teacher guide. $24.95 (032) $29.95 (074)

Math 5 (16K) Two tapes, 16 lessons & games. Addition, Subtraction, Multiplication & Division for ages 10-12. Workbook & parent/teacher guide included. $24.95 (032) $29.95 (074)

Math 6 (16K) Two tapes, 16 lessons and games. Addition, Subtraction, Multiplication & Division for ages 11-13. Workbook and parent/teachers guide included. $24.95 (032) $29.95 (074)

Math Quiz (16K) Do up to 50 problems in your choice of Addition, Subtraction, Multiplication or Division. Six levels. Grade school. $9.95 + $1.00 p&h (036)

Mind Bogglers (2K) Four mathematical puzzles. Analytical & spatial skills. Ages 10 & up. $14.95 (096)

Multiple Regression (16K) Listing. $5.70 (040)

Multiplication Primer (16K) An introduction to multiplication. 2-7 years. $9.95 (050)

Multiplication Tables (16K) Choose multiplier for up to 50 problems. Mistakes and corrections listed. 7-12 years. $9.95 + $1.00 p&h (036)

MXP-E (16K) Use up to 100 formulae, Preloaded with basic Engineering formulae. User-controlled. Auto-scaled. Cartesian & Polar graphs. Guide included. $15.95 (087)

MXP-M (16K) Contains basic math formulae. Capacity to work with up to 100 formulae. User-controlled. Polar and Cartesian graphs, auto-scaling. Guide included. Students & professionals. $15.95 (087)

MXP-O (16K & up) (Printer Optional) Allows manipulation and solution of up to 100 formulae. Expressions user definable. Cartesian or Polar graphs. Guide included. Students and practical applications. $15.95 (087)

Primary Arithmetic (N/A USA) (16K) Addition, Subtraction, Multiplication & Division in three levels. Animated reward. $11.90 (040)

Prime Numbers (1K) Listing. Generates primes from 3 to 10 million. Checks numbers for primes. $1.00 (040)

Rhodonea (Rose) Curve (1K) Listing. $1.40 (040)

Senior Level Maths Revision (N/A USA) (16K) Matrix multiplication & inversion; multi base arithmetic; calculus differentiation & integration. 30 question timed tests. $11.90 (040)

Sift I Statistical Interactive-Analysis for Timex Computers Vol. I (2K) 16 routines include: regressions, analyses of variance, sample tests, correlation analyses & probability evaluation. 92-page text/manual included. $19.95 (014)

Sift II Satistical Interactive-Analysis for Timex Computers Vol. II (16K) Twenty statistical routines: plots, regressions, analyses of variance, sample tests, correlation analyses & probablities. 120-page manual included. Students, educators, engineers & businessmen. $29.95 (014)

Spectrex (16K) Creates three dimensional perspective. Changeable angles. Draw, erase, and dot functions. Listable & modifiable. Requires only elementary knowledge. $15.95 (087)

Subtraction (1K) Listing. Drill for children. $1.00 (040)

Super Math (16K) Five levels of difficulty in the four functions. Graphic display. Grades for each ten problems. $14.95 (080)

Syncmath (16K) Math quizzes with 3 levels of difficulty. Game rewards double as keyboard-trainers. 6-16 yrs. $7.95 (090)

Times Tables (1K) Listing. Multiplication tables. $1.00 (040)

Times Tables (2K) Drills any table. Unlimited test questions. 6-8 years. $5.75 (050)

Total Triangles (16K) Gives the surface area for length. Gives weights for metal constructions. Encompasses the subject of triangulation. $9.95 (080)

Trig Teacher (16K) Learn basic trigonometry. Requires some basic math background. Includes instruction sheet. Game format. $9.95 (030)

World's Most Magic Square (1K) Listing. 8 × 8 "magic square". $1.00 (040)

World's Most Magic Square (1K) Listing. 16 × 16 "magic square". $1.90 (040)

Music

Chord Finder (16K) Input your notes, computer will name the chords with those notes. $5.95 post-paid (072)

Elementary Music Theory & Ear Training (2K or 16K) Uses text, graphics & sound generation to tutor drill & practice note recognition, intervals & melodic dictation. Several programs. 7 to adult. $7.95 (028)

Guitar For Beginners (16K) Teaches the parts of the guitar, basic chords, bar chords, and chord progression. $10.95 (080)

Music Educator (16K) Teaches the notes of the scale, name and timing of notes. Graphics. For beginners. $9.95 (080)

Musical Scales (16K) Shows any one of 8 scales in any key. Displays diagrams for guitar. Identifies tonic notes. Machine code. $9.95 post-paid

Music Tape (2K) Contains four programs. Turn the computer into a 2-octave instrument. A 12-tone calculator. A chord-finder from single notes. Transpose any chord progression to any other key. $5.95 post-paid (072)

16 Program Music Course (16K) Complete theory workbook: note, key, chord & clef recognition & instrumental drills. Two levels — each 16 programs. Beginner through intermediate. $169.00 (019)

Programming

Basic BASIC (2K) Step-by-step guidance to writing your own computer game. Includes blank tape and workbook in addition to program cassette. Age 12 & up. $17.95 (096)

Basic Course Solutions (1K) Presents solutions to end-of-chapter exercises in the Complete Sinclair ZX81 and Timex TS1000 Basic Course

(Melbourne House). Demonstrates chapter content. Produces 28 hard-copy listings. $5.00 (011)

Equational and/or Touchstone (1K) Listing. How to construct equational and/or program lines. $1.00 (040)

Fill Screen/Inverse/Memory Left (16K) Three sub-routines, common to any toolkit, listed and explained for the beginning machine language programmer. Good BASIC knowledge recommended. $9.95 (102)

Gridlock (2K) Third in computer literacy series. Four games teach uses of graphs, plots, screen display and Cartesian coordinates. Graphic display of any valid BASIC equation. Age 10 & up. $14.95 (096)

Kids Educational Pkg. (1K or 16K) Listing or cassette. Introduce 2-4 yr.-olds to computer keyboard response.
Listing $2.00; cassette $9.95 (029)

Linear Search (16K) In-depth treatise on a Machine Language programming technique for searching data. Concept fully explained. Construct a very fast and highly personalized data base program. $4.95 listing and test.
$9.95 with cassette (100)

Multiprogram Demo (16K) Tutorial: Move blocks of data in your RAM. Write simple M/C routines to hold several BASIC programs in memory simultaneously. Booklet plus tape fo four games. Intermediate programmers. $10.95 (090)

Snake Eyes (2K) Develop computer literacy. Probability theory and random generator featured. Game format. Second in series following "Turning the Truth Tables". Age 12 & up. $14.95 (096)

The Computer Coach (16K) Teaches the fundamentals of a computer system. Self-instructing. $10.95 (080)

Timex Sinclair Basic Course (16K) Manual and 2 tapes. Complete BASIC instruction, includes self-testing. Beginner to advanced. $24.95 (032)

Tiny Logo (16K) A sub-set of MIT LOGO. Teaches children computer programming concepts. $19.95 (032) (041)

T/S Tutor (16K) An introduction to the functions of the T/S1000,ZX81 keys in all 4 modes. Defines and explains for novices. $6.95 (004)

Turning The Truth Tables (2K) Game format. Learn and/or, greater than/lesser than and logical relations. Beginners — age 12 and up. $14.95 (096)

ZXData Finder (16K) Detailed tutorial text. High capacity information storage and retrieval tool. Example of such BASIC concepts as storage, retrieval and data base design. Several search techniques. Text presents advanced BASIC program methods. Intermediate level.
$9.95 listing and text.
$14.95 with cassette (100)

ZX Phone Book (16K) A 720-name telephone directory that serves as an example in teaching elementary level programmers BASIC file management and search techniques. Illustrates ADD, ALTER, DELETE and elementary search mechanisms. $4.95 listing and text.
$9.95 with cassette (100)

Reading

Alphabet Primer (16K) Teaches the alphabet to pre-schoolers. $9.95 (050)

Alphabet Soup (16K) Teaches pre-schoolers to identify letters and numbers. $7.95 (009)

Ator The ABC Gator (16K) Teaches recognition and sequence of the alphabet. Combines instruction, music and video games. $12.95 (080)

4-Program Speed Reading Course (16K) Four 16K programs. Complete instructions. Actual mechanical techniques are synthesized via your computer. Demonstrates basic concepts needed to improve your reading skills and speed.
$14.95 + $1.50 p&h (016)

Rapid Read (16K) Tachistoscope method. Speed & comprehension developed. Drills scored, automatic pacing. Charts progres. All ages, advanced reading skills. Includes users' guide. $19.95 (087)

Reading Lab (16K or 64K) Improve reading speed and understanding using the Tachistoscope method. Guide included. Reading material can be changed by user. For grades 1-6.
$19.95 + $2.00 p&h (001)

Word Play (16K) Four programs. JARGON generates jargon words. ANIMAL is a game that teaches all about animals. STORY uses input names, places, etc. in computer-generated stories. HAIKU composes poetry. All ages. $10.00 (101)

Words Quiz Vol. 1 (16K) Two levels, fifty words. Choose the correct definition. $7.95 (083)

Word Quiz Vol. 2 (16K) Two levels, 50 words. Choose the correct definition. $7.95 (083)

Word Quiz Vol. 3 (16K) 50 words, two levels. Choose the correct definition. $7.95 (083)

Religious Instruction

David & Goliath (2K) Game features Bible story questions. Flipchart included. Child to young adult. $12.95 + $1.50 p&h (012)

Proverbs (16K) Game format teaches 60 Biblical Proverbs. 6 levels of difficulty. $7.50 (020)

The Ark (2K) Game featuring questions about Noah's Ark. Flipchart included. Children to young adult. $12.95 + $1.50 p&h (012)

Science

Astronomer's Guide (16K) Contains Astromap, giving access to information on 800 stars and other celestial objects, and conversion — an astronomical time and coordinate conversion program for the experienced astronomer. Seven-choice menu. $14.95 (080)

Atomic Configuration (16K) Drill on nuclear and electronic configurations. Game format. 1-6 players. Ages 16 & up. $11.90 (040)

Compound Chemistry (16K) Game format. Use qualitative analysis to identify substances. 1-6 players. High school +. $11.90 (040)

E.E.I — Filter Design (16K) An aid for engineers and students. Provides information on bipass, low-or bi-pass filters. Plots available of all design criteria. $12.95 (080)

Chemistry

Forensic Chemistry (16K) Detective game format employing qualitative tests. Highschool level & up. $11.90 (040)

Introduction To Chemistry (16K) Three-part self-paced course. Teaches the basics. Lessons, reviews, self tests and a dictionary. $10.95 (080)

Physics

Countdown/303 Integral Physics (16K) Quizzes on topic of integral physics. 3 skill levels. Ages 16-18. $11.90 (040)

Hangperson/101 Electricity (16K) Graphic or verbal clues to 50 words & phrases related to electricity. $11.90 (040)

Hangperson/102 Forces (16K) 50 words or phrases related to forces. Verbal and graphic clues. $11.90 (040)

MXP-P (16K) Contains basic physics formulae. Manipulate and solve up to 100 expressions. Graphs in Cartesian or Polar, auto-scale. Guide included. Students and professionals. $15.95 (087)

The War Game (16K) Examines the effects of an atomic explosion on a city through variables of bomb size, distance from target & wind speed. Recommended for adults only. $15.90 (040)

Biology

Hangperson/104 (16K) Verbal & graphic clues to 50 words & phrases related to respiration, the skeleton and reproduction. Ages 16 & up. $11.90 (040)

Hangperson/105 (16K) Graphic & verbal clues to 50 words & phrases relating to biology. Ages 16 & up. $11.90 (040)

Hangperson/106 (16K) Verbal & graphic clues to 50 words & phrases relating to animal biology. Ages 16 & up. $11.90 (040)

Hangperson/107 (16K) Verbal and graphic clues to 50 words & phrases relating to plant and animal biology. Ages 16 & up. $11.90 (040)

Spelling

Capitalization Master (16K) Reinforces correct capitalization rules for study or review. Menu-driven. $10.95 (080)

Flash Spelling (16K) User enters up to 50 words to be tested. Misspelled words may be displayed with correct spelling. Grade school to Jr. High. $9.95 + $1.00 p&h (036)

Hangman Vol. 1 (16K) 50 words, game format. $7.95 (083)

Hangman Vol. 2 (16K) 50 words, game format. $7.95 (083)

Hangman Vol. 3 (16K) 50 words, game format. $7.95 (083)

Scramble (16K) Computer acts as a "moderator" between two human players. Computer jumbles words. Players earn points by unscrambling the words against a clock. Penalties for invalid or misspelled words. Select difficulty and duration. Very fast. $11.95 + $1.50 s&h (106)

Spelling Bee (16K) 25 sets of 5 words per level. Each set has one misspelled word to find and correct. Program tracks and lists words. $9.95 (080)

Spelling Primer (16K) Features 10 pictures and user participation. 2 to 7 years. $9.95 (050)

Word Quest (16K) Words are scrambled. Player must guess against the clock. 99-word vocabulary. $9.95 (080)

Utility (Teacher's)

Class Records (16K) Written by teachers. Menu driven. Practical and efficient record system. $19.95 (111)

Gradebook (16K) (Printer Optional) Exam and course performance analyzer and record. Statistical analyses and other useful options.
$9.95 + $1.00 p&h (036)

Grade Book (16K) (Printer Optional) Records up to 40 students per class. Unlimited classes. 30 grades per student. Weights grades. Lists all by student. 14-page manual.
$14.95 + $1.00 s&h (114)

Grade Master (16K) Student record. Average, high & low marks displayed. Class lists & averages. Self-saving. $15.00 (051)

Teacher's Gradebook (16K) Records class records. Averages and weights. Personal Performance Factor. Suggests report grades. Class or individual. Includes maintenance routine.
$9.95 (080)

Teacher's Gradebook (32K) (Printer Optional) Class records of tests, performance, homework, averages. Suggests student report grade. Menu-driven. Alphabetizing, maintenance routines & other options. $24.95 (052)

Games

Action/Arcade Games

Armegon (16K) Defend a space fortress against Zandax invaders. Screen-displayed shots/hits/score/best score.
$1 cassette, $2 listing (048)

Asteroid (1K) Listing Free. (040)

Asteroids (16K, graphics pad) Destroy incoming asteroids. Rotate, thrust and fire. $10.30 (040)

Attack Force (16K) Hold off the invasion while the planetary force fields charge up. Shields, mobility and rockets against teleportation, photon torpedoes and bombs. $11.95 + $1.50 s&h (106)

B-29 Bomber (16K) Bomb the stationary or moving tank. Curved bomb path. Ages 7 and up. $7.95 + s&h (025)

Bat Cage (2K) Thirty-six levels of play. Catch the egg and put the bat in the cage. Then fight off the other bats trying to rescue the caged bat. $9.95 (080)

Bigflap Attack (16K) Defend yourself against the giant birds. Ten levels of play. $12.95 (080)

City of Xon (16K) 3-D flying & shooting game similar to Zaxxon arcade game. Listable. All ages. $21.95 (008)

Deep Space (16K) Seek out and destroy enemy invaders in your sector. $5.95 (083)

Defender (16K, graphics board) Shoot down the attackers from the side of the screen. Move up, down and fire. $10.30 (040)

Demolisher (16K) Demolish the growing wall before it gets to you. $11.70 (040)

Demolisher/Air Attack (16K) Two action games. $17.20 (040)

Demolition/Ten-Pin (16K) Destroy the wall before the moving ball reaches it. Turn your computer into a bowling alley. $9.95 (074)

Earthquake (16K) Outrun the tumbling building blocks. Ages 7 and up. $7.95 + s&h (025)

Fortress of Zorlac (16K) Command your fleet of spaceships to rid the galaxy of the dreaded alien Zorlac. Fast action. $10.95 (080)

Frogger (16K) The arcade game without the sound effects. $17.95 (080)

Galaxy Invaders (16K) Battle with swooping invaders. $14.95 (032)(041)

Galaxy Warrior/Star Trak (16K) Defend your star base and seek the enemy throughout the galaxy. $16 (040)

Grand Prix (16K) You are a driver in a race, controlling speed, gear changing and breaking. Random hazards generated by the computer challenge your effort to complete the race intact. $14.95 (111)

Graphics Ladders (16K, graphics board) Get down the ladders and bury the enemy on your way. $11.80 (040)

Hopper (16K) Like the arcade game Frogger. $11.70 (040)

Intruder Alert (16K) Two-player action. Escape from the guardian robots. Shoot and move in eight directions. User defined specifications. Machine code portions. $14.95 + $1.50 p&h (099)

Invaders (16K) Ten skill levels with scoring. $8 (040)

Invaders (16K) Screen yourself from bombing aliens. Ten levels of play; all machine code. On-screen scoring. $14.95 (032)(041)

Invasion Force (16K) Blast away at the mother ship — carefully machine code action. $14.95 (032)(074)

Keystroke Management (2K) Four office environment games: Musical Desks, Corner Office, Office Automation and Go To The Top. $14.95 (096)

Krazy Kong (16K) Rescure Jane and avoid the barrels. Then topple Kong. $11.70 (040)

Lander (16K) Three play levels, five screens per level. Multiple targets. Land before you crash or run out of fuel. $10 (057)

Laser Wars (1K) Fire at the invader. Good graphics. listing $1.80 (040)

Lemniscate of Berndulli (1K)
listing $1 (040)

Limacons (1K) listing $1 (040)

ML Asteroids (16K) Complexity increases as you play. Split the rocks with lasers. $1.95 (058)

ML Raiders (16K) All machine code. Sight on the alien raider and blast it out of the sky. $4.95 (058)

Mad Dog Tank Blaster (16K) Entertaining and instructional. Learn to program graphics as you play. Plant a land mine in the tank's path as you avoid being shot or run over. $4.95 (listing & text) $9.95(listing, text & cassette) (100)

Marine Rescue (16K) Race against time and sharks to save the crew of a stricken submarine. $9.95 (032)

Missile Launcher (16K) Use your 15 missiles to destroy the enemies' 5 munition dumps. $11.70 (040)

Mugsy (16K) $11.80 (040)

Murgatroyds (16K) $11.80 (040)

Murgatroyds Revenge (16K) $11.80 (040)

O-Bliterat & Dire Straits (1K) Clear the screen within the time limit. Steer around obstacles. $2.80 listing (040)

Panzer SS(16K) Shoot enemy tanks. $7.95 (009)

Pilot (16K) $11.80 (040)

Pinball (16K) Plays like a real pinball game. All machine code. $12.95 (080)

Pinball Wizard (16K) Fast-action pinball game simulation. Complete with ball-return, shooter, flippers, bumpers, midge, trapdoors, bonus points and more. Records high scores. $14.95 + $1.00 s&h (114)

Ram Runner (16K) 26 levels of player ability. Ram other runners without running into an obstacle. $12.95 (080)

Return From Space (16K) Come home without hitting a star or running out of fuel. $11.70 (040)

Roadhog (16K) A three-dimensional night-driving game. Avoid accidents and watch your cost per mile. $6 cassette, $2 listing (048)

Scyon's Revenge (16K) The Scyons are back for more action. $16.90 (040)

Shootist (1K) A shooting gallery
$1.80 listing (040)

Space General (1K) Starship vaporizes aliens with cannon fire. User watches the action.
$1.80 listing (040)

Space Gunner (2K) uses only two fingers to shoot down space ships. $1.80 listing (040)

Space Gunner (16K) Fly through the complex space maze attacking fleets of hostile invaders. $9.95 (037)

Space Intruders (16K) $11.80 (040)

Space Invaders (16K, graphics board) Improved characters. One or two players. On-screen scoring and high score. $10.30 (040)

Space Invaders (16K, graphics board) Features autorepeat and on-screen scoring. For two players. $11.80 (040)

Space Trek (16K) $14.95 (076)

Sparks! (16K) Multiple screens and difficulty levels. All machine code. Rescue people from the 100-story skyscraper fire. $9.95 (099)

Star Battle (16K) Save Earth from the Scyons. Ages 15 and up. $16.90 (040)

Star City (16K) Pilot your star cruiser through the colonies, avoiding space junk.
$6 cassette, $2 listing (048)

Starhike (16K) Battle hostile warships on four levels of difficulty. Graphics and status display. All ages. $6.95 (004)

Starship Invasion (16K) Destroy invisible enemy bases on a vital mining planet. Realistic graphics and total mobility. Survivor's abilities rated by the computer. $11.95 + $1.50 s&h (106)

Stormlander 3 (16K) Make an emergency landing of your airliner. Three screens of action. Four levels. Speed and variables change with level.
$9.95 postpaid (090)

Strategy At Sea Three games. Shipwar (Battleship), Convoy (a shooting gallery) and Sub Hunt (track and sink 5 subs). $10 (057)

Subsearch (16K) You are in a surface vessel, battling an aircraft and a submarine.
$6 cassette, $2 listing (048)

Super-Slide (16K) Race your bob sled, avoid obstacles. Make it to the Olympics, compete with 80 others. Special 'gold medal' display. $9.95 (090)

Tai (16K) Escape in your spaceship. Avoid obstacles. $11.70 (040)

Tailgunner (16K) You control a rebel space gun. Destroy as many of the Imperial Fleet as you

can before you go into hyperspace. $14.95 (111)

The Invaders (16K) You can fire while moving. All in machine code. $11.90 (040)

Timeblasters (16K) Space battle game features time acceleration on missing shots. Blast a space station to slow it down again. Start with 5 ships. All ages. $12.95 (010)

Winged Avenger (16K) $14.95 (076)

Working Mother's Dilemma (2K) Four games. Mad Dash, Shopping Mall, Carpool and Harried Housewife. $14.95 (096)

Z-Trek (16K) Seek and destroy up to 200 Zylons. 24-line display, moving graphics. Some machine code. $9.95 (099)

Zor (16K) Two mighty robots join combat on a barren planet. Can you win as defender of Earth? $14.95 (032)(041)

Zorx Wars (16K or 64K) Your starship battles Zorxian fighters, space cruisers, killer satellites and neutron bombs amid the black holes. All ages. $12.95 + $2 p&h (001)

ZX Froggie (16K) Guide your frog through hazards. Four levels of play. Fast action. $14.95 (041)

ZX Galaxia (16K) Formations of hostile Galaxians attack your ship in deep space. You must protect the Earth with your laser gun. $14.95 (037)(041)

ZX Scramble (16K) Pilot your craft through the space maze. Evade and fire missiles. All machine code. $14.95 (032)(041)

Adventure Games

Adventure 1 (16K) Explore the caves. Find the treasure. $13.50 (040)

#477 Adventure (16K) price on request (040)

Adventure To Korvas (16K) Role-playing game. Map display shows progress as you seek a rare artifact. $14.95 (037)

Alien (16K) Based on the film. You have your choice of weapons as you stalk your quarry around the ship. $14.95 (111)

Alien Intruder/Hieroglyphics (16K) Escape the deserted alien spaceship. Decode the 39-symbol alphabet to make your getaway. $10.60 (040)

Alien Space Ship (16K) Escape aliens in search of humanoid slaves with your pet android, Fred. $14.95 (032)(041)

Antropuss (16K) Travel through the cave, avoiding malicious bats and the man-eating Antropuss. You have only five arrows for self-defence. $9.95 (042)

Around Europe In 80 Hours (16K) Collect souvenirs on your whirlwind tour of Europe to win a wager. $11.95 (032)(041)

Artillery (16K) Given the target range, the user enters initial velocity and angle of elevation. Graphic display, four levels, scoring. $9.95 (042)

Aztec Gold (16K) Encounter mummies and other weird things in the temple of Tikhun in your search for gold. $12.95 (037)

Catacombs (16K) Find the gold before time runs out for you. Unlimited levels. $15.90 (040)

Deathship Sabotage (16K) Stop the deathship before it gets to Earth. $12.95 (037)

Dragon Lair (16K) A strategy-fantasy game. Magic, Wizards, theives, spells, monsters and dragons. Variable difficulty level. Includes guide booklet. $15.95 (087)

Dry Gulch (16K) Explore an old west ghost town in search of treasure. Vocabulary is over 100 words. SAVEable in progress. $9.95 (115)

Encounter (16K) Match wits with powerful alien intelligences. Can you prove your sentience? $14.95 (032)(041)

Escape From Shazzar! (16K) Your only escape is through the Temple. Avoid deadly hazards, collect keys and treasure. $12.95 (074)

Escape From Stalag Luft III (16K) You are a P.O.W. Dig tunnels, make disguises, forge papers. Select your opponent character. Instructions and game card included. $14.95 (079)

Espionage Island (16K) Crash land on an island in the South Seas. Avoid capture, respect the natives and find the secret. $14.95 (032)

Game Master (16K) A control and record-keeping system for fantasy adventure games. Records up to 12 characters and 6 monsters. Rolls dice. Compatible with "Dungeons and Dragons". $14.95 (060)

House Of Gnomes (16K) Find the treasure and escape with it. $10.60 (040)

Inca Curse (16K) Adventures in an Inca temple in the South American jungles. $14.95 (032)(041)

Keltinor's Keep (16K) Search the castle for treasure. Combat hostile creatures. Keep has 20 rooms per level. $7.95 (058)

Keys To Gondrun (16K) Gondrun the wizard has lost his keys. Find them in caves of the enchanted forest. $9.95 (032)

Merchant Of Venus (16K) You must be a skillful trader and a skillful pilot in order to succeed. $9.95 (080)

Miner's Revenge (16K) Graphics adventure puzzle. Find the motherlode in the maze of cavern tunnels. $9.95 postpaid (090)

Morloc Castle (16K) All machine code. Find and enter the secret castle. Defeat the wizard to gain the magic medallion and escape. About 200 words of vocabulary. SAVEable in progress. Difficult. $14.95 (115)

Nightmare Park (16K) Use your wits to get through Nightmare Park. Features surprising twists. $14.95 (111)

Planet Of Fear (16K) Stranded on an alien planet, you must brave the perils to regain your ship and escape. $14.95 (032)(041)

Quest For The Staff Of Life (16K) Search over 80 rooms to regain the stolen staff. Large vocabulary. $12.95 (037)

Robbers Of The Lost Tomb (16K) Recover four tablets hidden in a 100-room multi-level tomb. Age 15 and up. $14.80 (040)

Space Defender (16K) A strategy game with graphic starmap. Defend your Space Station against enemy missiles. $14.95 (111)

Space Ship (16K) You have been captured on an enemy slave mission. Gain the ship's control room for freedom. $16.50 (040)

Star Trek (16K) Clear the galaxy of the Klingon menace. Overcome the hazards of the galactic sectors. $9.95 (042)

Star Trek (16K) Command the Enterprise to destroy Klingons. $10 (040)

Star Trekker (16K) See what a good Trek can be. Based on the adventures of the popular series. $14.95 (111)

Starquest (16K) Run the gauntlet of galactic perils in a search for a New Earth paradise. $14.95 (032)(041)

Subspace Striker (16K) Attack to disrupt Federation supply lines. Be prepared to defend your ship. Graphics. $14.95 (041)

Supermonzxer (16K) Features multilevel caves, marauding monsters, giant bats, crooked arrows, bottomless pits, a magic sword and man-eating spiders. All ages. $6.95 (004)

The Damsel And The Beast (16K) Seek the damsel in the palace. Kill the beast. Three skill levels. $13 (040)

The Wild West Adventure (16K) Travel through the harsh terrain of the Wild West. Use your head and become rich. $14.95 + $1.50 s&h (113)

The World Of Sangrel (16K) Search a world for a rare element. Split screen progress display. $12.95 (037)

Trader (16K) A 48K program in 3 units. Variables passed for continuity. Animated illustrations. $19.95 (041)

Trader Jack (16K) $14.95 (076)

Trident (16K) Many hidden dangers and concealed aids. $9.95 (080)

Vault Of The Centaurs (16K) 14.95 (062)

Volcanic Dungeon/Hangman Rescue the Elfin princess. Defeat monsters. One or two players. 400 word vocabulary. $10.60 (040)

Z.S.S. Sinclair . . . Coldshutdown Graphics and text. The specimens of the Zoological Survey Ship Sinclair are loose. Repair the ship and fight off the creatures before coldshutdown. $12.95 (091)

Ball Games

Breakout (2K) The ball and paddle game. $15.10 (040)

Breakout (16K) Three paddle sizes. A variation provides random targets in addition to the walls. $6 cassette, $2 listing (048)

Breakout (16K) $11.80 (040)

Breakout (16K) The popular game. $14.95 (111)

Bust Out/Loco (16K) For one or two players. All machine code. Two versions of the popular Breakout game. Loco is more difficult. High scores and high sets recorded. $14.95 + $1 s&h (114)

Mazeball (16K) Obstacle bouncing ball game. Seven mazes, high score. All machine code for speed. All ages. $12.95 (010)

Trap (16K) Catch the bouncing balls. Progressively difficult and fast. $9.95 (080)

Board Games

Backgammon And Dice (16K) Easy to learn, fast and exciting. Chance and skill. All machine code. Graphics of rolling dice and doubling cube. $14.95 (080)

Battleship (16K) Two players, or you and the computer. $7.95 (009)

Battleship (16K) Keep your forces hidden while you try to sink the enemies'. $9.95 (032)(041)

Battleship (16K) Play against the computer. Destroy its fleet. $10.60 (040)

Chess And Chess Clock (16K) Six levels of play. In machine code. All the legal moves. Graphic display. Separate records of plays for easy reference. Switch sides in mid-game. $14.95p (080)

Chess I (Enhanced) (16K) Full display of chess board. Six levels of play — two with competitive time limits. For the advanced player. All machine code. Printer optional. $14.95 (032)

Chess 1.4 (16K) Ten skill levels. Graphic display. Can change sides during the game. $11.90 (040)

Chess II (Master) (16K) The most powerful chess game available for the T/S1000. 7 levels of play, four in competitive time limits. Includes book of 32 openings. $24.95 (032)(041)

Chesslab 5.0 (16K or 64K) Analyses variations or adjourned positions. Aids but does not play. 90% machine code program. Includes user manual. All ages. $19.95 + $2 p&h (001)

Domino (16K) Play against the computer. $9.95 (042)

Monopoly (16K) $14.95 (076)

Nerd! (16K or 64K) Play against the computer in this simple board game. All ages. $13.13 + $2 p&h (001)

1K Chess (1K) One level. White queen or white king pawn openings. $9.95 (041)

Reversi (16K, N/A USA) Based on a minamax tree search with instant machine code response. $11.90 (040)

Timeware Chess (16K) Try to beat your computer. Won the chess competition at the Consumer Computer Show in London. $14.95 (074)

2K Chess (2K) Good graphics and a superior range of moves for the unexpanded T/S1000. $14.95 (032)(041)

Card Games

Bridge (16K) Improve your playing and bidding. Adjustable skill level. One to four players. Challenge the computer. $14.95 (041)

Card Cut (1K) $1 listing (040)

Crazy 8 A Poker 4 (16K) Graphic card display. Score-keeping. Peek at computer's Crazy 8 hand. Play 4 card Poker against the computer. $10 (057)

Firing Line (16K) Graphic solitaire. Displays four cards at a time. Continues until all 52 cards have been displayed. Computer monitors for winning. $14.95 + $1 s&h (114)

Jeopardy (16K) Choose your score, then get it by matching pairs of cards out of 45. $11.70 (040)

Matrimony/Noah's Ark (16K) Graphic solitaire games. Matrimony displays all cards face up. Noah's Ark displays only the bottom row face up — more difficult. Both monitored for winning. $14.95 + $1 s&h (114)

Reddog (16K) Bet on beating the top card. Win money from the pot. Beat the computer. $9.95 (047)

Strip Poker (16K) The computer deals the cards, takes the bets and announces the winner for two or more players. Instructions included. $9.95 cassette (030)

Games of Chance

A Night In Las Vegas (1K) Roulette, Blackjack, Craps and Slot machine. Manual, guide cards, color layouts, chips and three color keyboard overlays included. $9.95 (079)

Blackjack (16K) As played in Nevada casinos. Up to five players against a dealer. Split pairs. Double down. Insurance. Allows continuous game. $9.95 (032)

Blackjack (16K) Up to 6 players. Simultaneous display of all hands. Las Vegas rules. Split pairs, double down and insurance. $9.95 (039)

Blackjack (16K) Graphic Display. $9.95 (042)

Blackjack (16K) Continuous play. Nevada-style. Hit, stand, double-down, split and take insurance. Running score. $10 (064)

Casino Pak I: One-Armed Bandit/Blackjack (16K) $14.95 (074)

Craps (16K) Computer rolls and scores. $9.95 (042)

Dog Races (1K) Watch the dogs chase the rabbit and guess the winner. $2.80 listing (040)

Gambler One (16K) Bandit (slot machine) and Roulette. $9.95 (083)

Handicapper (16K, printer optional) Enter statistics on each horse in the field. Computer calculates percent chance to win. Weighted point system. $9.95 + $1 s&h (053)

Horse Master (16K) Analyses data from the Racing Forms. $7.95 (009)

Horse Race (1K) A five-horse race that can be expanded. No ties. $1 listing (040)

Horse Race Handicapping System (4K) A scientifically derived system that works. Ten factors from the Daily Racing Form considered for each horse. Display of odds. $24.95 (094)

Jackpot Casino (16K) Tour the casino with your winnings and try your luck at Roulette, Craps, Blackjack, Slots, Racing, 5-Card Draw and Acey-Ducey. All ages. $6.95 (004)

Jeopardy/Vegas (16K) Cards, roulette, and slots. $17.20 (040)

Kasino Kraps (16K) Just like the real thing. Dice visible at all times. Multiple bets possible. $9.95 (080)

Las Vegas Casino (16K) $14.95 (076)

Las Vegas Package (16K) Two games: Vegas 21 Blackjack with 5 decks, reshuffling, split pairs, double down and tens ratio; Lucky 7 slot machine with moving graphics. $2.50 listing, $12.95 cassette (029)

Play Bingo (16K) Random number plus letter combinations generated. All previously called combinations displayed. $4 listing with S.A.S.E. (035)

Roulette (16K) $9.95 (042)

Roulette Wheel (1K) Gives Las Vegas wheel frequencies for red and black. $1 listing (040)

Slots (16K) Six sets of graphics. Lets user choose 5¢ to $1 machine. $9.95 (032)

Slot Machine (16K) Six figures appear at random in three windows. $9.95 (042)

Slot Machine (16K) Las Vegas-style wagering. Realistic payoffs. Animated graphic display. $9.95 + $1 s&h (098)

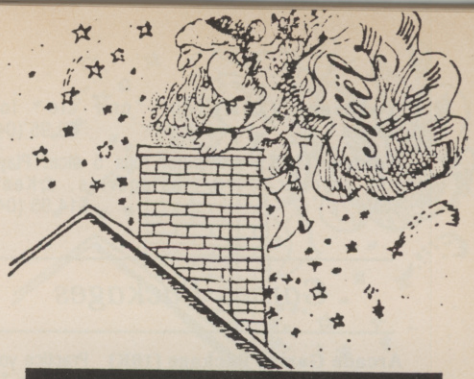
The Die Is Cast (1K) Graphic dice roll. $1.30 listing (040)

The Gambler (16K) Blackjack and slot machine. Full graphics. $14.95 (080)

Thoroughbred Handicapping (16K) Generate a class rating and speed rating for each horse. Employs statistical method. Includes instruction pamphlet. $12.50 (022)

2K Jackpot (2K) Six games of skill and chance including Roulette, Craps, Slots, Blackjack, Horse race and Acey-Ducey. $6.95 (004)

Vegas (16K) Play roulette and the slot machine to win. $11.70 (040)



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Yahtzee (16K) For one to four players. $9.95 (042)

Yahtzee (16K) Computer rolls 5 dice. Played like poker. 13 categories. Keeps score. $14.95 (041)

Games Packages

Arcade Games Package (16K) Practice your target-shooting with Tank Trap. Try Tic-Tac-Toe against the computer on 3 levels of difficulty. $2.50 listing, $11.95 tape (029)

Classic Games (16K) Lunar Lander, Dogfight, Mindmaster and Life. $9.95 (079)

5-2K Games (2K) Spider Sam, Artist, Labyrinth, Mine Field, and Galactic Scout. $12 (040)

Fun And Games Package (16K) Three games: Lunar Lander, Secret Code and Draw. listing (1K) $2, tape (16K) $9.95 (029)

Game Tape (16K) Checkers: computer records, two users play. Six Dice accomades any number of players. Also includes a fast Big Letters routine. $5.95 post-paid (072)

Games Pack (16K) Action games. Two for 1K, five for 16K. $10.40 (040)

Games Three (2K) Depth Charge, Bowling, Bingo and Tic-Tac-Toe. $9.95 (083)

Games Two (2K) Darts for two players and Mastermind. $4.95 (083)

Grab Bag II (1K) Calculator seem-to-memory, counter systems. $1 listing (040)

Gunfighter/Tic-Tac-Toe/Life (16K) A graphic wild west shootout. One or two players. Six levels. A challenging version of the popular game, and a simulation of cell colony growth based on user-entered data. $11.95 (032)

1K Games Pack (1K) Eleven games for the unexpanded T/S1000. Maze, casino and action games. $9.95 (032)(041)

Program Pack I (1K) 6 games — Digiclock, 9-Lives, Reaction Test, Dice, Gobbler, and Patterns. $21.40 (040)

Program Pack 2 (16K) Pontoon, Fruit Machine, X's and O's, and Bio-rhythms. $16 (040)

Program Pack 3 (16K) All machine code. Astropilot, Graphic Designer and Roadrace. $21.46 (040)

Program Pack 4 (16K)All machine code. Includes Asteroid and Surround. $16 (040)

Program Pack 5(16K) Includes Traps, Sheep, Reaction Timer and Trails. $16 (040)

Program Pack 6 (16K) 3-D X's and O's in machine code and Mars Rescue. $21.30 (040)

Program Pack 7 (16K) Zombies and Mount Mahem. $16 (040)

Program Pack 8 (16K) Word Search, Towers of Hanoi, Germ Warfare and Intercept. $16 (040)

Return From Space/Missile Launcher (16K) $17.20 (040)

16K Games Pack (16K) Four challenging games. Tic-Tac-Toe, logic and 2 action games. $14.95 (041)

10 Great Games (16K) $14.95 (076)

The Challenger I (2K) Contains Amazer, a maze-chase game with 10 difficulty levels, and Tic-Tac-Toe. $9.95 (080)

The Mixed Game Bag I (16K) Contains Bowling, Robot War and Bingo Caller. All feature graphic displays. $9.95 (080)

Mixed Game Bag II (2K) Mind-game package includes Memory Magic, Concentration and Supermind (decipher the graphics, five levels of play). $9.95 (080)

The Mixed Game Bag III (2K) In Blitz, bomb the targets. 256 speeds. In Rats Nest you trap your opponent. 256 speeds of play. The Snake collects the money its pit. Sketch Pad lets you draw on the screen. Cross The Road resembles a part of the Frogger arcade game. $9.95 (080)

2K Six Pack (2K) Entertaining and instructional. Word Juggler, Electro-Sketch, Space Dodger, Scrambler, Guessing Game and Spiral Spots. $9.95 (087)

Zombies And Sword Of Peace (16K) Defeat the zombies by luring them into potholes. Free yourself from a dungeon to become Monarch of Oz. $14.95 (032)

Maze Games

Bactrac Like "Pac-Man." Fifty-four possible initial set-ups. Running and best score. $6 cassette, $2 listing (048)

Centepede (16K) Like the arcade game. $11.80 (040)

Centepede (16K, graphics board) Shoot it in the middle or you have two to fight. $10.30 (040)

Centepede (16K, graphics board) High scoring game. If you can't destroy one, it becomes two. $11.80 (040)

Chewter (1K) Like Pac Man. $2.80 listing (040)

Crazey Mazey (2K) Four maze games: Byte Bite, Slalom, Labyrinth and Cat and Mouse. Age 8 and up. $14.95 (096)

Dragon Hunt (16K) Find and slay three dragons in their caves. Find the magic sword, evade giant bats and the ghastly monster. $12.50 (109)

Eureka (16K) Search for the hidden paths to the treasures. Difficulty increases as you improve. $6 cassette, $2 listing (048)

Ghost Hunt (16K) Chomp through the maze. Get the ghosts. $11.70 (040)

Gobbleman (16K) Run around the maze chased by ghosts. Personalized "high score" feature. All in machine code for speed. $14.95 (032)

Grimm's Fairy Trails (16K) A young prince is trapped in a maze, chased by the maze-dwellers. Can you gain the life crystals and sacred stones? Six levels of play. $14.95 (080)

Marbles, Mazes And Sink Holes (16K) Sixty mazes of varying skill level. 100% machine code. Race against time. All ages. $12 (024)

Maze (16K) A series of progressively difficult invisible mazes. Solve each one before the air runs out. You have only three magic weapons and your wits. $11.95 & $1.50 s&h (106)

Maze Drag Race (16K) Maze is 9 times screen size. Avoid the obstacles. Several skill levels. $11.70 (040)

Mazeman (16K) (N/A USA) Machine code. Like Pac Man. $11.90 (040)

Mazogs (16K) Find the treasure. Battle Mazogs. Detailed graphics. New maze every game. $20 (040)

Mr. Munchee (16K) Munch away and avoid the trolls. Three mazes and variable speeds. $14.95 (041)

Pac Man (16K) Like the original. Full screen. Instructions. Easy controls. $21.30 (040)

Pack 'Em In Monzxer (16K) Chomp through the maze avoiding goblins. Several levels. All ages. $6.95 (004)

Pakguy (16K) All machine code. Three full-screen mazes. Variable speed and skill levels. $6.95 (058)

Peckman (16K, Kayde graphics board) Like Pac Man. $11.70 (040)

Puckman (16K) All machine code. $11.80 (040) $14.95 (111)

Speed Snake (16K) Ten mazes. Snake eats nuts and grows. Fast and skill-challenging. $14.95 (041)

Supermaze (16K) A 3-D maze complete with trap doors, gold bars, marker stones and a compass. Ten mazes, up to four options each. $14.95 (080)

3D Monster Maze (16K) You are *in* this 3-D maze. The Tyrannosaurus Rex is after you. $15.90 (040)

Tunnels (16K) For two players. One is the Evil Mayor, creating mazes. The other is the local good guy, in the maze. Age 8 and up. $7.95 & s&h (025)

Mind/Word/Puzzle Games

Alphabet Soup and Numbers Up (16K) The object is to arrange the pieces correctly. Can be saved at any point. All ages. $14.95 & $1 s&h (114)

Challenge I (16K or 64K) Two games: "Code Cracker" and "Tic-Tac-Toe". Variable skill levels. All ages. $12.95 & $2 p&h (001)

Computer Match (16K) Like the game of Concentration. Find your match on the screen. $7.95 (009)

Concentration/Word Challenge/Number Challenge (16K) match numbers, shapes or patterns against a player or the computer. Find the words with up to six players. Test your memory against the computer with up to six players. $14.95 (032)

Crypto (16K) Challenging cryptograms of definitions or quotations for you to solve. Enter your own as well. $14.95 (041)

Flips (16K) Similar to Rubik's cube. Several difficulty levels. New puzzle every time. $6 cassette, $2 listing (048)

Hangman (16K) Two games — one with over 100 movie stars and titles, the other with superheroes and their archenemies. $9.95 (032)

Hangman (16K) Seven categories, create your own dictionary of up to 400 words. Program includes starting dictionary in 7 areas. $10 (057)

Island Squares (2K) $1.90 listing (040)

Letter Logic (1K, 2K or 16K — specify) Version of a popular game. Improve your logical thinking. Indicates "right on" and "almost" $7.95 (1K or 2K) $11.95 (16K) plus $1.50 s&h (113)

Mega Mind (16K) $14.95 (062)

Mine Field (16K) Ten levels of difficulty. Navigate the mine field after one look at the map. $9.95 (083)

Murder In The Ram (16K) Race against the computer and up to 5 other players to solve the "who-dunnit". Clues given by the computer. $6.95 (004)

Number Squares (16K) Graphic brain teaser. Arrange the 81 pieces according to the rules. Can be saved and re-started. For all ages. $14.95 & $1 s & h (114)

Quiz Kit (16K) Create a quiz of 23 questions with multiple-choice answers. $16.90 (040)

Rubik's Master (16K, printer optional) Scrambles and solves the infamous cube step-by-step. Displays each move in 3-D graphics and simple notation system. $15 (Computer Engineering Services)

Semaphore (2K) A "Rubik's Cube" simplified for younger children. $1 listing (040)

Serious Cryptology (1K) Find the key and decode the messages. $3.80 listing (040)

Shell Game/Number Maze (16K) Keep track of the hidden "pea". Move the numbers into patterns within the square. $9.95 (032)(041)

Spinner (16K) Like Rubik's cube. $1.90 listing (040)

The Cube Game (16K) Three views, solid, unfolded, and 3-dimensional (see-through). Start with the cube solved or pick up from a previous session. $12.95 (080)

The Nowotnik Puzzle (16K) The computer scrambles the pattern. You try to return it to its original condition. $14.95 (074)

The Puzzler (16K) "Inversion" takes a minimum of 250 moves to solve. "Double Inversion" is twice as difficult. SAVEable in progress. $12.95 (080)

Tic-Tac-Toe (16K) Good graphics. $2 listing (116)

Towers Of Hanoi A problem as old as the pyramids. How many moves will it take you? $14.95 (111)

Top Secret (16K, printer optional) You can encode and double-encode messages. Over 65,000 possibilities. Also decodes. Printer option. $13.40 (040)

Spinner (16K) Like Rubik's cube. $1.90 listing (040)

The Cube Game (16K) Three views, solid, unfolded, and 3-dimensional (see-through). Start with the cube solved or pick up from a previous session. $12.95 (080)

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Party-Novelty Games (Entertainment)

Biomate (16K, printer optional) Three programs. Performs compatibility analyses. Plots Biorhythms. Conducts match-making searches. Also incorporates data base management system. $15.95 (087)

Biorhythms (16K) Track your cycles for intellectual, physical and emotional factors. Find your phase for the day. Includes booklet on theory and application. $11.95 (032)

Biorhythms (1K) Results for any date. $1 listing (040)

Christmas Party Package (16K) Three programs. Scrolls "Merry Christmas" across the screen. Plays "Jingle Bells" through a nearby radio. Draws automatically. $3 listing, $10.95 tape (029)

Constellation (16K) Displays night skips of this century. Move telescope anywhere on Earth. Stars displayed by constellation or magnitude. $15.80 (040)

Does Nothing Program (1K) Grunts and groans figuratively, but does nothing. $1 (040)

Dr. Floyd (16K) Carries on a conversation with you using psychoanalytic techniques. Resembles artificial intelligence. Age 10 and up. $10 (101)

8X Sideways Billboard (16K) Scroll 300^s characters right to left. $1.80 listing

4X Sideways Billboard (16K) Scroll 1000^s characters right to left. $1.80 listing (040)

Madame Ruby Package (16K) Artificial intelligence program responds to your questions with unique or standard answers. $2.50 listing, $12.95 cassette (029)

Magic Cube Generator (16K) Generates four by four by four magic cubes. $1.90 listing (040)

Magic Square Generator (16K) Generates 384 four-by-four magic squares. $1 listing (040)

Moving Billboard (1K) Double-spaced message lines move up the screen and repeat. $1 listing (040)

News Bulletin Board (1K) Scroll your message (up to 250 characters) across the screen. $1.80 listing (040)

Personal Bio-Rhythms (16K, printer optional, specify make) Find your peak and critical days. Complete one-month cycle of physical, emotional and intellectual patterns. $9.95 (039)

Program Of Days (16K) An historical databank. Noteworthy events accessed by date. $11.95 (032)

Random Music (1K) Plays random music through your television's speaker. $1.80 listing (040)

Solar System File (16K) Finger-tip access to amazing facts about celestial objects and relationships. $11.95 (032)

Spiral Of Archimedes (1K) $1 listing (040)

Sunrise/Sunset Complete months or years of tables for sunrise and sunset times of every 3 days for any location and time zone entered. $9.95 (039)

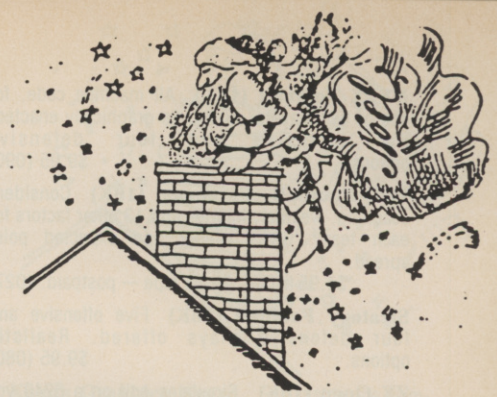
Tarot (16K) Let the cards predict your future. Full 78-card Tarot deck. Full graphic representation of the 22 major Arcana cards. Computer reads and explains each card in your fortune, or describes and defines each card of the deck. $9.95 (080)

The Fantastic Music Machine And Light Show (2K) Two programs — turn your computer into a 3-octave musical instrument. Stores, edits and plays back 400 notes in 2K, 7000 in 16K. Light show races a kaleidoscopic pattern around the screen. $9.95 (079)

The Ultimate Forecast (16K, printer optional) The computer shuffles and deals the Tarot Cards. Position and significance of each card is given. User interprets. $4.95 listing, $9.95 cassette, postpaid (027)

Tower Billboard (16K) 8X vertical scroll. Listing $1.40 (040)

Virtuoso (2K) Synthesizes music. Ten octave range, 150 note length, whole to 32nd dotted notes & rests. Self performs songs at any tempo. Uses TV or radio speakers. $6.95 U.S. & Can., $9.95 elsewhere (054)



Your Key Colors Using Numerology (16K) (Printer Optional) Study your character using color and numerology. $9.95 (039)

Simulation Games

Airline (16K) You are the new chairman and have 7 years to increase your funds by a factor of 10 and take over the competition. $16 (040)

Copy Shop (16K) Open a new business. $16 (040)

Dictator (16K) Maximum your profits without getting overthrown or killed. $18 (040)

Inheritance (16K) Prove your financial acumen in order to inherit a fortune. Two challenges to meet. $11.95 (032)(041)

Monarch! (16K) Control your kingdom. Make wise decisions for your people. $12.95 (074)

Pop Star (16K) Question and answer format. Make it big or go broke. $9.95 (032)

Presidential Campaign (16K) Manage your campaign well and get elected. One to four players. $16.90 (040)

Restaurant (16K) Open a new restaurant. $16 (040)

Run The Country (16K) Can you successfully tinker with the budget and policies — and still get elected? $11.95 (032)(041)

Stock Market Game (16K) Play the market. Win if you accumulate $50,000. $12.95 (080)

Wall Street (16K) One to four players invest in the market. Computer advises. $16.90 (040)

You're The Boss (16K) Guide your business to success or bankruptcy. For one or two players. $10.95 & $1.50 s&h (018)

Sports

18 Hole Golf (16K) Up to five players. Graphic display of each hole. Three different 18-hole courses. Display gives hole number, par, current shot, current score & name of player. $10.00 (057)

Football (16K) Uses statistics to plan strategies and calculate gains. Tactics available to both user & computer. Stationary graphics. All ages. $6.95 (004)

Football (16K) College football for 1 or 2 players. Seven offensive plays, computer defence. $9.95 (083)

Minigolf (16K) Eighteen holes. Nine levels of difficulty. Variable hazards. Animated ball. Option to play same or new random course. $6.00 (057)

Golf Handicapper (16K) (Printer Optional) Handicaps computed in accordance with guidelines established by the USGA for 18-hole courses. Menu-driven, seven options. $20.00 (011)

NFLX Football (16K) All machine code, for one or two players. All moves graphically enacted. Six offensive and four defensive options. $9.95 (090)

Pro Football Forecase (16K) Considers coaching, weather, injuries and 13 other factors for each team. Gives winner and expected point spread.
$4.95 listing, $9.95 tape — postpaid. (027)

Strategy Football (16K) Five offensive and four defensive plays offered. Realistic options. $9.95 (080)

ZX Open (16K) Simulates golf on a 5240 yd. par 71, 18 hole course. Select club & hook slice or miss the ball. Realistic hazards. Automatic scoring. Ages 15 & up. $16.95 (017)

Books

Basic Basics for the Timex Sinclair 1500 by M.P. and S.J. Barnette. Introduce your family to BASIC. Many useful applications for the home. $9.95 (074)

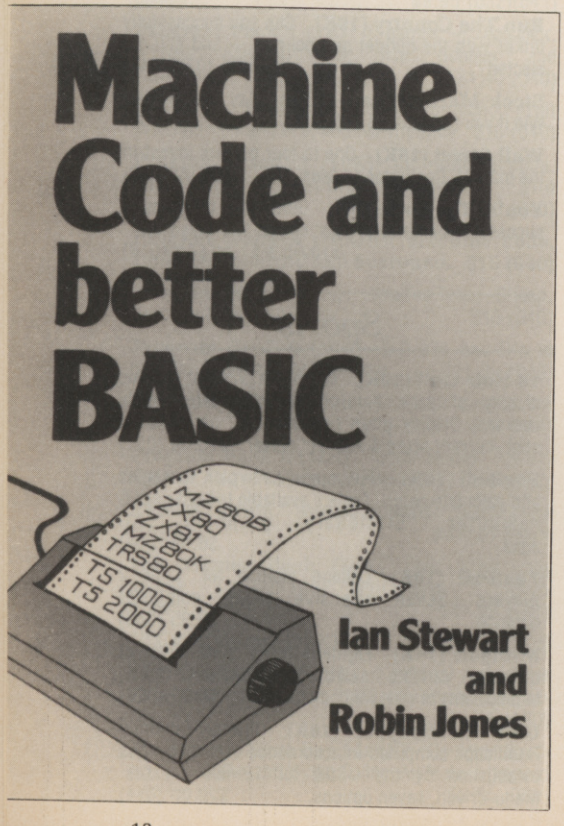
Basics Of Timex Sinclair 1500 Basic by A. Wolach. Introduction to programming in BASIC. Step-by-step, with examples. $9.95 (074)

Byteing Deeper Into Your ZX81 by Mark Harrison. Price on request. (040)

Computers For Kids Sinclair Edition by S. Larsen. $6 (040)

Converting To Timex/Sinclair Basic: A Guide To Translating Basic Programs by S.L. Bird. Translate programs written in other BASICs to run on the T/S1000. Differences and examples given. Over 130 BASIC instructions discussed. $14.95 (034)

Explorer's Guide To The Timex Sinclair 1500 by M. Lord. Discover new features and techniques. Learn machine code programming and elements of RAM. Thirty programs. Hardware tips. $9.95 (074)



50 1K/2K Games For The Timex Sinclair 1000 by Gourlay, Walsh and Barnett. Pick up programming tips and techniques. $13 (040) $9.95 (074)

Fifty Programs For The Timex Sinclair 1000 (Unexpanded) by L. Carter. Fifty ready-to-run listings for beginners and experienced. Games, puzzles, calculations, filing, graphics, calendars and others. $6.95 + $2 s&h (107)

49 Explosive Games For The ZX81 by T. Hartnell. $11.90 (040) $9.95 (074)

Getting Acquainted With Your ZX81 $11.70 (040)

Graphics, A-Z How to program hi-tech graphics. Special section on the Memopak HRG module. Easy to understand machine code section. $19.95 (008)

Hints And Tips For ZX81 Price on request (040)

How To Use The Timex Sinclair Computer by J. Willis $4.80 (040)

Learning Timex Sinclair Basic by D.A. Lien. Full length step-by-step instruction for the beginner. 352 pages. Paperback. $14.95 (016)(032)

Machine Code And Better Basic by I. Stewart and R. Jones. Introduces structured BASIC programming and machine code. $11.95 (103)

Machine Language Programming Made Simple For Your Sinclair & Timex TS1000. by Melbourne House. $15.90 (040)

Making The Most Of Your ZX81 by T. Hartnell. Sixty exciting programs. Debugging, tricks, commands and statements. $13 (040) $9.95 (074)

Mastering Machine Code On Your ZX81 by T. Baker. Comprehensive guidebook. Many programs and examples. "All the programming techniques you'll need." $12.70 (040) $9.95 (074)

More Uses For Your Timex/Sinclair 1000: Astronomy On Your Computer by E & H.J. Burgess. Ready-to-run programs. Observe the sky on your monitor screen. $8.95 (088)

Music/Sounds Package Requires 2K. How to broadcast music and sounds to a nearby radio with no additional equipment. Five listings included control the radio frequency interference. $2.50 (029)

Not Only 30 Programs Programs illustrate the capabilities of the unexpanded T/S1000,ZX81. Programming hints and explanations throughout. $9.95 (032) $10.30 (040)

Peek Poke Byte & Ram ZX81 Price on request. (040)

Pocket Book Price on request. (040)

Programming Your Timex Sinclair 1000 In Basic by M. Eisenbacher $11.20 (040)

Sinclair ZX81 Prog/Ri Applications Price on request. (040)

Sinclair ZX81/Timex Sinclair 1000 Statistics Twelve 16K programs. 200 pages. $11 Same programs on 6 cassettes $15 (043)

Stretching Your ZX81 To Its Limit Price on request. (040)

TS Microdrive Technical Brochure Discusses the uses, requirements and capabilities of disk and high speed tape drive systems for the T/S1000,ZX81. Describes the T/S Microdrive. $3 postpaid (008)

T/S1000 Programs, Games And Graphics by Jones and Stewart. $11.90 (040)

T/S1000 Users Guide by Dr. Girratano. Step-by-step introduction to programming in BASIC. $11.90 (Vol.1) (040) $9.95 (Vol.1) (067) $12.95 (Vol.2) (067)

TS2000 Technical Brochure Complete description drawn from dealer specification sheets. $3 postpaid (008)

The Basic Handbook, An Encyclopedia Of The Basic Computer Language by D.A. Lien Largest and most current collection of BASIC terms available anywhere. Alphabetical listing, with test programs and sample runs. Variations in usage and alternate spellings. Tips on BASIC translation from other BASICs. 480 pages. Paperback. $19.95 (016)(032)

The Best Of Sync edited by P. Grosjean. $11.70 (040)

The Complete ZX81/TS1000 Basic Course by Melbourne House. Includes 2 tapes. $31.90 (040)

The Explorers Guide To The ZX81 And The Timex 1000 by M. Lord. $12.60 (040)

The Gateway Guide To The ZX81 And ZX80 by M. Charlton $11.70 (040)

The Timex/Sinclair Directory Where to find virtually everything for the T/S1000,ZX81. Photos, descriptions and supplier's addresses. 90 pages. Paperback. $5.95 postpaid (008)

The Timex Sinclair 1500 Pocket Book by T. Toms. Everything you need to know about your computer. BASIC, program listings, handy subroutines, examples and a complete guide to programming. $9.95 (074)

The Timex Sinclair 1000 Basic Handbook by D. Hergert. Clear examples of each word in the T/S1000 BASIC vocaulary presented dictionary-style. Proper syntax carefully explained. Short sample programs demonstrate commands. Notes on subtleties and extra features. $7.95 (088)

The Timex/Sinclair User's Encyclopedia by G. Phillips and J.C. March. Cross-referenced alphabetical listing. Total guide to the T/S computers. Useful tool for the new owner. 350 pages. Paperback. $14.95 (006)

30 Hour Basic ZX81 Edition Price on request. (040)

30 Programs For The Timex PC1000 by Melbourne House. $11.20 (040)

34 Amazing Games Price on request. (040)

37 Programs For Timex 1000 Sinclair ZX81 $10.80 (040)

Timelost For The Timex/Sinclair 1000 Comic book adventure instructs in programming. For the unexpanded T/S1000,ZX81. $6.95 (067)

Timex/Sinclair Basic Programs In Minutes by S.R. Trost. Take full advantage of the T/S1000 functions. Practical programs. $7.95 (088)

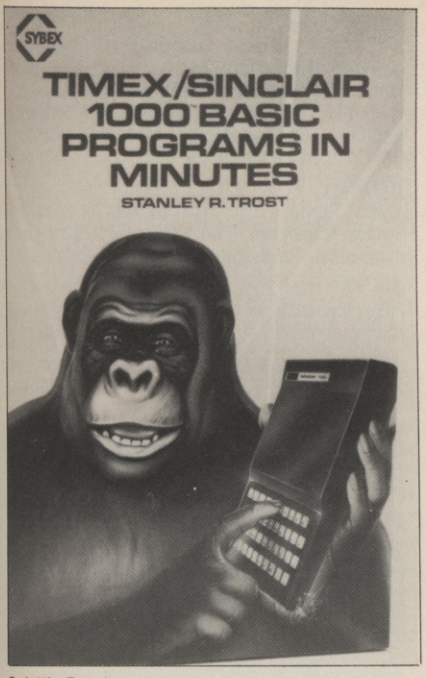
Timex/Sinclair 1000 Pocket Dictionary Lists words and concepts. Complete set of Z80 machine commands. Tips on saving memory. Complete character set. $4.95 (067)

Timex Sinclair 1000: Programs, Games and Graphics by R.Jones and I. Stewart. A guide for beginners. Graphics programming, debugging techniques. Over 50 ready-to-run games. $10.95 (103)

Understanding Your ZX81 ROM by Ian Logan. $15.90 (040)

Using And Programming The Timex Sinclair 1000 $12.10 (040)

Using The Timex/Sinclair 1000 by R.M.



Coletti. For those who nave mastered the owner's manual and wish to go on. Programming and hardware modification suggested. Sample programs provided. $9.97 (034)

What Can I Do With 1K? Price on request. (040)

Your Family, Basic And The Timex 1000 by M. and J. Barnett $14.76 (040)

Your Timex Sinclair 1000 And ZX81 by D. Hergert. A beginners' guide to the T/S1000 computer. "How to" directions. $6.95 (088)

ZX81 Basic Book Replaces the T/S1000,ZX81 user's manual. Much more in-depth and complete. Explains computer functions with illustrative examples. Very "user friendly" for beginners. $12.95 (008) $15.50 (040)

ZX81 Companion Price on request. (040)

ZX81 ROM Disassembly Part A & Part B by Ian Logan. $19.90 (040)

Hardware

Graphics

Block Painter (1K) Paint on the screen horizontal or vertical lines one character wide. $1.00 listing (040)

Block Pattern Generator (16K) Generates 65535 designs based on 16-pt. array. $2.80 listing (040)

Diagram Maker/Saver (2K) (Printer Optional) Prints any character, paints screen from keyboard, has flashing eraser. Can be copied to printer and saved. $11.80 (040)

Draw And Recall (16K) Draw on the screen and store the result. Like "turtle" graphics, move without drawing, erase and delete also featured. Young programmers. $9.95 tape $2.95 listing (030)

8K Rom Character Generator (1K) Where it is and how it works. How to use it for 4X or 8X characters. $2.80 listing (040)

8X Characters (1K) (Printer Optional) Up to 8 characters on the screen together. Printable. $1.40 (040)

Ellipses And Circles (1K) $1.40 listing (040)

Etch-A-Screen (2K) (Printer Optional) Draws text and graphics in any direction. Any speed. Save or print. With 16K of memory, store 20 video slides and display them in rotation with selected pauses. Also, CRAZY PRINTER — draws random pattern on the screen, wild and fast. $9.95 (079)

Fast Scrolling (2K) Short MC routines to use in your BASIC programming. Eight scrolls in all-four on the diagonals. Helps produce "professional" graphics. Twenty-five page booklet with listings. $4.95 (010)

4X Characters (1K) $1.40 listing (040)

Graphics Billboard (1K) Moves upwards. Displays words or graphics. $1.00 listing (040)

Graphics Pac 1 (16K) An introduction to Sinclair graphics. Two random picture drawers, a screen formatter and a "Doodler". $10.00 (101)

Hexal Pattern Generator (16K) Generate and display 65535 patterns based on 36 pt. array. $3.80 listing (040)

IBAL (16K) Wire-frame modelling program. Store any object in memory and view it from any point. Expands image to maximum possible size on the screen. Easy to use. $14.95 + $1.50 p&h (005)

Kayde 3D/3D (16K) $11.80 (040)

Metagraphics (16K) Create elaborate drawings. Over 2000 different graphics charcters and backgrounds. Unlimited artistic freedom. Especially for children. $12.95 (010)

Mysterious Matrix (16K) Plots a matrix of patterns defined by input. $2.80 listing (040)

Olbique Painter (1K) Sketches diagonal lines. $1.00 listing (040)

Plot Painter (1K) "Paint" in all directions on the screen. Erases, can make isoareal patterns. Has PIXEZ counter. $1.40 listing (040)

Quilter (1K) (16K) Paint in one corner and the computer will duplicate in blocks like a quilt. $1.00 listing (040)

Random Fences (16K) Plots random fences scrolling up the screen. $1.80 listing (040)

Screen Painter (1K) Sketches horizontal and vertical lines. $1.00 listing (040)

The Great Communicator And Opmax (16K) Animated likeness of a familiar political figure. Try your hand at video ventriloquism. OPMAX creates moving "paintings" on your screen. $9.95 + $1.50 p&h (005)

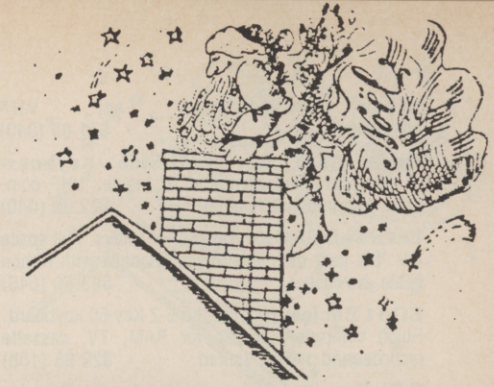
3-D Graphics (16K) Create three-dimensional objects and view them in two dimensions. Can be viewed from any relative position, angle or distance. $8.75 tape, $2.50 listing (007)

Tower Billboard (1K) Prints six 4X characters on the screen. $1.00 listing (040)

TS-Art (16K) (Printer Optional) Graphics program and LOGO-style educational tool. Indirectly teaches concepts of arithmetic, geometry and computer science. Eight directions. Selectable background. Define new graphic commands. Expand, compress or rotate. Save or print. $12.95 (+ $1.50 s&h in US, $2.50 s&h abroad) (045)

DVC-2 Inverse Video Kit Small board fits inside computer case. Only 4 wires to connect. Provides a direct video output to drive a standard video monitor. Switch selectable normal or reverse video. $18.95 + $1.50 p&h (071)

Graphic Charts Plan your displays on these printed paper forms before coding. Saves time. 8½" x 11". Grid, line and column numbers, X,Y coordinate numbers. Pack of 100 $4.95 (030)



Kayde Graphics Board Fits inside the computer with ribbon connector and 5 wires. 4K EPROM gives 6 sets of 450 characters plus their inverses. Spare slot for 4K TOOLKIT ROM, 2K RAM or 2K User Definable Graphics. Located in 8-16K block. $40.00 (040)

Kayde 2K User Definable Grapics Chip plugs in the KAYDE GRAPHICS BOARD. Gives 256 user defined characters. Complete with software. $21.30 (040)

Memo-Rez 64K Provides high resolution graphics. Compatible with plug-on peripherals. Switchable 8-16K region. $189.95 (008)

Memopak Hrg. Resident 2K EPROM programmed with a full range of graphics subroutines enables display of high resolution "arcade game" style graphics. Fully programmable capabilities. $ (055)

Video Inverter Small circuit requires four solders. Permits switch from black characters on white to white characters on black. Toggle switch. Versions for VHF and UHF output. Complete instructions. $16.95 (008)

Zotex Light Pen (N/A USA) Draw and save from the screen. $131.50 (Canadian) (040)

Interfaces

AGF Stackable Joystick Interface II For one or two joysticks. Controls eight directions, including 45 degrees and fire. Comes with demo etch-a-screen cassette. $36.00 (040)

Basicare Persona Enables growth of an ORGANIC MICRO on the T/S1000. Buffers all signals from the expansion port via ribbon cable. "Talks" to other modules via a 64-way Organic Bus configured to fit into the given Address Map. $59.95 (032)

Byte-Back RS232 Interface Stackable. Baud rate adjustable. 75-9600. $61.50 (040)

I/O Expansion Board Permits I/O interfacing for the T/S computers. Similar to the standard micro computer S-100 bus. Allows simultaneous connection to a number of external devices. $89.95 (032)

Memopak RS232 Interface Basic and Terminal Modes Communicate along industry standard lines with other computers and peripherals, including modems and printers. $99.95 (055)

Keyboards & Accessories

Chirper Sounds on key entry. Sound varies with function — can signal end of line. Sounds can be programmed. Included is a demo program that converts the keyboard into a music keyboard of two octaves. $9.95 (003) (040)

DK'Tronics Full Size Keyboard Computer fits inside the case. Regular output bus and small motherboard for memory. 52 keys including the separate numeric, period, shift and cursor pad.

Needs modification for VHF computers. $71.60 (040)

Dean Case For Full-Size Keyboard Keyboard and computer fit inside. UHF computer requires modification. $22.00 (040)

Dean Full-Size Keyboard 47 keys. Full space bar. Six user-definable keys. Attaches with ribbon cable. No case. $93.60 (040)

EC-11 Enclosure For the E-Z Key 60 keyboard. Holds computer; access for RAM, TV, cassette recorder and power. Vented. $29.95 (108)

E-Z Key 60 Sixty moving keys. Plugs-in. Numeric keypad, auto-shift on eight keys, two shift keys, full space bar. $89.95 (108)

Gladstone Professional Keyboard & Case A full-sized keyboard. 47 keys and full space bar. Plugs in by flexible connector. Long-wearing. $79.95 (032)

I.D.S. 44-Key Rebuilt Keyboard Uses 8 inch ribbon cable. Keys include 2 shift, 2 #1/EDIT and 2 unused. Letter keys only fully legended. $47.00 (040)

I.D.S. On/Off Toggle Switch For #001 Chirper (Requires Chirper) Requires hole in csae and 2 solder connections. $2.20 (040)

I.D.S. Repeat Module Solders inside case with 9 wires. Converts all keys to autorepeat. may interfere with some games. $18.40 (040)

KD-81 Full size, 41 keys. Extra shift key. Case holds keyboard and computer. No soldering. $59.95 (086)

KP-1 Keyboard Plans Step-by-step plans for converting to a full-size keyboard. Soldering skills required. $7.50 (068)

Kayde Full Size Keyboard Uses ribbon cable and 15 solder connections. 40 keys plus repeat key. $74.40 (040)

Keyboard On/off switch, two shift keys, two ENTER keys, shift lock, full space bar, seven single-stroke keywords, repeat key. Optional numeric keypad. Feedback problems eliminated. $129.95 (111)

Keyboard Bleeper! Installs inside the computer. Produces a destinctive BLEEP! when keys are pressed. Words on all keys but shift and in SLOW and FAST modes. $25.00 (015)

MK IV Keyboard & Numeric Pad Uses same switches as DEC and Hewlett-Packard keyboards. 41 keys and full space bar. 19-key pad plugs into keyboard. Long-wearing.
Keyboard $89.95
Keypad $49.95 (008)

MK II Click Switch Overlay Fits over the original keyboard. Features depressable "click" keys. Promotes speed of data entry. Extra key available for conversion to special functions. $79.95 (008)

Memopak Keyboard Comes with buffered interface. Full-size, with Sinclair legends. Plugs in. Compatible with further add-ons. $99.95 (055)

SL-6 Shift Lock Module Speeds typing, allows one-finger entries. Aids the handicapped. Touch sensitive switch automatically holds SHIFT "ON" for one second, (adjustable) long enough for 3-5 key entries. Solders inside computer case. Has LED to indicate "ON". All parts included except a touch-contact (screw-head, wire, rivet).
$12.99 + $.75 s&h (110)

Tactile Feedback Keyboard Overlay Clear vinyl with holes over each key. Feel the keys. Adhesive backed. Speeds keyboard use. $3.95 (109)

Typex/81 Clear vinyl self-adhesive overlay. Rectangular "key" openings permits touch-typing. Speeds programming and improves game-playing.
$5.95 + $1.50 p&h (031)

Memory

Basicare Drom (Requires Basicare Persona) Ultra low power memory with battery backup (rechargeable). Save programs under development or frequently-used routines or data. Individual 2K blocks can be protected accidental overwriting. $74.95 (032)

Basicare Minimap (Requires Basicare Persona and 64K) Key module for adding large amounts of memory. Extends 64K address space up to a possible 1 Mbyte. Organized into up to 16 vertical 64K pages. Can be defined dynamically from within a program. $59.95 (032)

Basicare RAM 16 (Requires Basicare Persona) (Minimap Optional) 16K of add-on memory. Onboard address decoding permits simultaneous use of many RAM 16 modules in conjunction with MINIMAP. $49.95 (032)

Basicare RAM 64 (Requires Basicare Persona and Minimap) Four blocks of 16K, all of which can be used simultaneously under the control of MINIMAP. $149.95 (032)

Cramic-81 16K RAM Uses CMOS technology for permanent data retention. Can be removed and retains data. Loads almost instantly. Virtually zero error. $179.95 (032)

DK'Tronics 64K Memory 56K usable. 8192-16384 block is switchable by moving a link. Compatible with 2040 printer. $111.80 (040)

Dream-81 64K RAM Gives your computer the total amount of RAM its processor can address. 0-16K area is de-selectable. ROM socket may contain up to 16K (27128) of EPROM. Quickly loads from EPROM to RAM, error-free. $169.95 (032)

EPROM Cartridge Kit All the parts necessary to build a plug-in cartridge that will accept 2716, 2732, 2732A or 2764 EPROMS. Memory mappable in 4K or 8K increments in 0-16K. (0-32K without RAM pack.) $16.95 + $2.00 p&h
$8.50 bare board only (115)

EPROM Programmer Assembled Assembled and tested.(See kit.) $59.95 + $3.00 p&h (115)

EPROM Programmer Kit Complete kit. Compatible with 16K to 64K memories. Requires a 30 volt or greater power supply capable of delivering 50 ma or mose — schematic included. Adapter needed for some RAMS.
$49.95 + $2.00 p&h (115)

EPROMS 2732, 2732A and 2764 EPROMS. Write for prices and availability. (115)

Gladstone 64K RAM Adds programming power to your computer. Maximum capacity. Completely reliable, warranted for 6 months. $99.95 (032)

Kayde 16K RAM Will not wobble. Compatible with T/S2040 printer. $39.80 (040)

MK IV Memory 16K RAM Battery back-up guards against memory loss due to power fluctuations. Provides up to 30 minutes of operating power. $74.95 (008)

MK IV Memory (64K) Features switchable battery back-up. Also has switches to control the 8-16K area of RAM. Compatible with hardware and software requiring the 8-16K area. EPROM socket can be assigned any address. $158.95 (008)

MX — 16KP 16K RAM module. Built-in output connector for piggyback. $49.95 (086)

MX — 64KP 64K RAM module. Built-in output connector for piggyback. $119.00 (086)

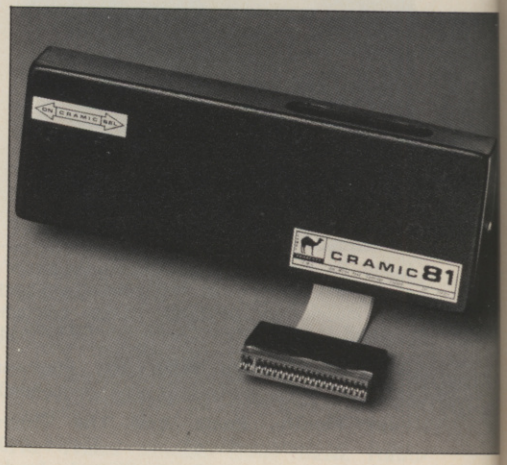
Memic-81 A 4 kilobyte RAMpack which can store programs without power. Tiny power requirement is met by a lithium battery. Resides in the 8-12K area of memory map, can be moved within the 8-16K region. $69.96 (032)

Nonvolatile Memory Designed to fit in the 8-16K area. Retains data when the computer is powered-down. Store BASIC programs or build a library of MC routines and system utilities.
$32.95 — kit with 2K memory
$18.00 — three additional HM6116LP — 3 CMSO RAM's + $1.95 s&h (038)

ROM-81 ROM reader. Instantly calls up programs. Provides two 24-pin sockets for up to 8K of memory expansion. Two 2716's or 2732's can be mapped into the 8-16K area. $34.95 (032)

Sin 16 Uses 30% less power than other RAM's. Fully compatible with other plug-ins. Long life. Best connector on the market. $35.00 (101)

Sinclair 16K RAM The original memory add-on. $47.60 (040)



16K Memopak Expands your computer for serious applications. Plugs-in. **$49.95** (055)

64K Memopak Directly accessable. Runs 16K programs unaltered. Design allows maximum array capacity. **$149.95** (055)

32K Memopak A full 32K of directly accessable RAM. Holds an extended data base. Compatible with other add-ons. **$99.95** (055)

Printers (& Accessories)

Inkit! Re-inking kit for all printers with continuous fabric ribbons in separate housings. Increases ribbon life by five times or more. Comes with instructions and all pigment matrix printer ink. High quality results. $6.95 (087)

Memopak Centronics Parallel Interface Interface for parallel printers of the Centronics type. Fully compatible with Sinclair BASIC. **$74.95** (055)

Paper For 2040 Printer Prints blue on white. Three rolls per package. $14.40 (040)

Printer Interface (For Axiom GP-100A printer. Requires Prof. Electronics I/O Board, Hunter Products 8K RAM module & 16K RAM pack.) Hardware with tape. Uses ports A & B of the 8255 I/O Board. Printer commands and MC stored in 8K CMOS RAM on Hunter board. $30.00 cable, instructions, programs & cassette. $30.00 assembled Hunter Board. $45.00 I/O Board (066)

Prowriter Model 8510 (Requires Centronics-type parallel interface.) Full feature programmable dot matrix printer. Six alphabets, exceptionally dense print quality, graphics capabilities, bidirectional printing 120 characters per second, up to 136 columns. One year warranty. On sale for $399.00 + $11.95 s&h (100)

Report Generator (16K) Data acquisition and control board. Printer interface (centronics). Real time clock/calendar with battery backup. 8-BIT in and out ports. CMOS A/D converter, 8 channel, 8-BIT. BUS connector for RAM pack. ROM resident firmware. $79.95 assembled & tested. (026)

Seikosha Full Size Printer Package (RAM with switchable 8-16K area required.) 80-column dot matrix printer. Upper and lower case letters. Automatically fills lines. Just plugs in. $339.95 (008)

Sinclair ZX Printer Paper Silver-colored. Packs of three rolls. $11.00 (040)

Smartface Printer interface. For use with parallel or serial printers. Uses no RAM. No user routines. Compatible with other add-ons. $109.95 specify printer model. Pin Out and plug requirements. (009)

T/S2040 Thermal Paper Superior texture-similar to regular white stationery. Specify blue or black print. 85 feet by 4¼ inches. $5.95 per roll (008)

Therma-Print Paper For the T/S2040 printer. $9.15/4 rolls (82 feet) black print. $7.80/4 rolls (82 feet) blue print.

Timex 2040 Printer $$89.95 (086)

2040 Printer Paper Prints black on white. Three rolls per package. $23.00 (040)

ZX81 Printer The original. Uses 4-inch silvered paper. $119.60 (040)

ZX Printer Full alphanumerics and sophisticated graphics. Copy command prints screen display. 50 characters per second, 32 characters per line, 9 lines per vertical inch. Compatible with other add-ons. One roll of paper included. $79.95 (032)

ZX Serial Printer Interface Connects your computer to any serial printer. Outputs an ASC II RS-232 signal through the MIC port. Software is 256 bytes of relocatable MC. Hardware parts cost about $10.00. Requires one connection inside the case. $5.00 for plans and listing. (105)

Programming Aids

A/D — D/A Board (Requires I/O Expansion Board.) Provides two channels of ADC and two channels of DAC. 8-bit resolution is obtained in 100 microseconds. I/O command requires a single line of PEEK or POKE. Sample programs provided, with simple application suggestions. $89.95 (032)

Anti Crash Bracket Attaches Sinclair RAM to computer. $2.40 (040)

Anti Crash Bracket Holds the computer, ZX printer and 16K RAM. $4.00 (040)

BCS Board Beeper, clock and switchboard. Provides facilities for timing, periodic input or measurements, manual stop/start and sound alert. Sample programs included for introduction of features. $79.95 (032)

Basicare Toolkit (Requires Basicare Persona.) Accepts up to 8K of utility programs in EPROM/ROM. In address space after on-board ROM. Allows for calling TOOLKIT — held routines via the USR function. $44.95 (032)

BLOPROM-81 EPROM programmer with new "friendly screen" approach to instruction. User notes almost unnecessary. Professional features. $179.95 (032)

Byte-Back Control Board Controls up to 8 channels, each one to 250 volt, 1 Amp. Has its own power supply. $71.80 (040)

Compuserve Starter Package Everything you need to start with COMPUSERVE DATA BASE including manual, 1D number and 5 hours time. $35.00 (040)

Data-Assette Zx99 Automatic Tape Controller Controls up to 4 tape recorders through their remote jacks. Allows merging of programs and creation of a large data base. $171.60 (040)

Data-Assette ZX21 Metered Cassette Interface Gives a metered indication of sound level to help with tricky problems. $19.80 (040)

Eprom Programmer For 2516, 2532, 2716, & 2732. Put your programs in EPROM. $44.95 (032)

Hargrave Superdata Save System (16K+) Combination of hardware and software that loads 16K programs in 30 seconds. Verifies saves, scans tapes and prints names of programs, gives bytes remaining, renumbers basic lines in steps of ten. Has earphone jack. $43.20 (040)

I.D.S. Reset Button Peforms system reset. Requires two solder connections and hole in case. With 64K pack does not reset the 8-16K block. Leaves chips powered up and saves surges. $0.90 (040)

Kayde 4K Tool Kit ROM Plugs into KAYDE GRAPHICS BOARD. Located in 8-16K and occupies lines 9990-9999. Functions are HELP, RENUMBER, BUYTES FREE, COPY, DELETE, KEEP, INSERT, ALTER, FIND MOVE and VERIFY. $19.60 (040)

L-Monitor Assures first time LOADS. Sensitive, reliable microammeter. User adjustable. Output for earphone or duplicating. Comprehensive instructions. Head alignment function. $23.50 assembled and tested. $17.50 kit postpaid first class mail(046)

Level-VU Prism Line-of-sight visibility and magnification of cassette tape counter. Attaches easily to the recorder body or lid. $2.95 + $1.00 p&h (047)

Mem-Minder Quick reference card fits on top of your computer. Contains a graphic memory map, report codes, system variables, PEEK and POKE formulas, room for 16 of your own addresses. Aid for graphics and machine code programming. Durable. $4.50 (109)

Personal Software Services

Q-Save Cassette filter/amplifier interface between computer and recorder. Cleans signal. Loads 16K in 29 seconds, 48K in 110 seconds. Signal

overload LED and save verify feature. $42.16 (040)

Ramstrap Sturdy strap secures RAM to the computer, prevents crashes. $3.00 (U.S.) $3.50 outside U.S.A. (070)

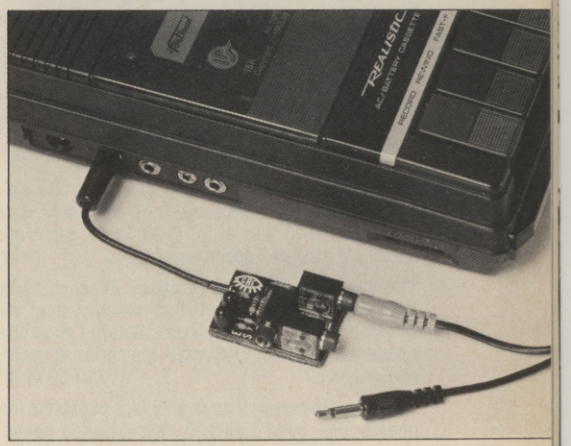
TP-1 Recorder Control Plans Circuit schematic for easier tape recorder use. Ends cable plugging and unplugging. Built-in microphone for voice labelling tapes. Low level load monitor speaker. Radio Shack parts cost approximately $20.00. Some electronic "know-how" required. $5.00 (068)

Tape Loading Aid Three LEDs indicate correct loading volume level. Earphone jack permits audio monitoring. SAVE/LOAD switch. Resets to "K". $33.00 (earphone $3.50) (015)

Tree-Forth (2K RAM) Chipbased FORTH language ROM replacement. Multi-tasking. Controls 10 functions simultaneously. Almost as fast as machine code and understandable like BASIC. $49.95 (081)

Vu-Load Monitor Enables to observe and adjust for the optimum level of cassette output signal. Gives positive save indication with automatic level control cassettes. $29.95 + $2.50 p&h (047)

Winky Board II Helps load difficult tapes. Monitor lights indicate volume level. Earphone jack to hear program. Can save two cassettes simultaneously. Cleans up noise. Use in tape head alignment. $19.95 assembled & tested. $19.95 kit + $1.00 s&h (075)



Z-Dubber Cassette-computer interface. Improves signal for loading and saving. Allows you to connect two recorders together to make high quality back-up tapes. $31.95 ppd. (104)

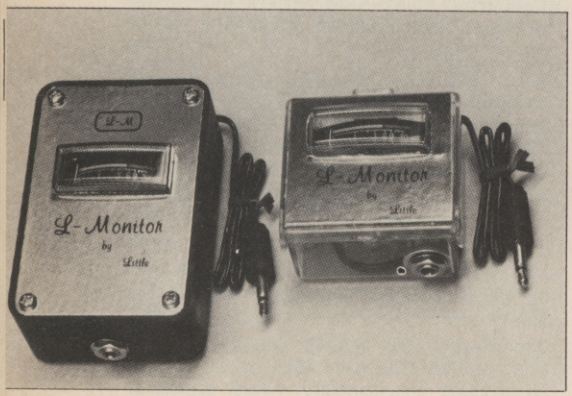
Sound

Bach Box III Full feature musical synthesizer circuit board plugs into back of computer. Three voices with all processing including multi-modal filter. Sound effects or serious music. External input permits use of filter for other instruments. $39.95 ppd (072)

DCP Speech Pack Contains all letters of the alphabet, some general words and numbers from zero to over one million. Uses POKE commands. Compatible with other add-ons. Contains speaker and volume control. Extend the vocabulary with additional Work Pack ROM's. $99.95 (032)

The Parrot (16K) Plug-in module. Generates all 64 discrete sounds of the spoken English language. Includes software which strings together and pronounces these sounds. Compatible with other add-ons. Output jack for speaker. $59.95 + $4.00 s&h (073)

Zon X Sound Unit Plugs-in. Completely self-contained. Designed specifically for T/S computers. $49.95 (032) (040)



Utility

Adapter Kit For Programmer To Non Feed Through Memories Such as required in the EPROM PROGRAMMER KIT for RAM packs similar to TIMEX or SINCLAIR — without connectors on the back. $14.95 (115)

Byte-Back Modem Stackable modem with RS232 port and software. $191.00 (040)

CS-1 Timex 1000/Sinclair ZX81 Schematic Diagram $5.00 (068)

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DK'Tronics Ribbon Cable Attaches wide memories to the output bus when using the DK'TRONICS full size keyboard. Gets rid of wobble problems when using Sinclair memories or heavy add-ons. $15.50 (040)

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Easy Eraser Simulate with documentation. Short UV bulb and easy-to-follow instructions. User should have some mechanical and safety knowledge. $19.95 + $2.00 s&h (002)

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Floppy Disc System Uses Model FDCS Disc Interface. Single or Dual Drive. 250K bytes storage per drive. Complete with interface, disc drive (second optional) drive power supply and case. $499.00 (second drive $228.00) (015)

Hardware Package Sinclair ZX81 with KAYDE GRAPHICS BOARD, AUDIOGRAPH CHIRPER, CHIRPER ON/OFF and SYSTEM RESET installed. Quantities limited. May substitute T/S1000. $120.00 (040)

I.D.S. Edge Connector 23-pin female edge connector with wirewrap pins. $4.10 (040)

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Joystick Plugs into the E-Z Key 60 keyboard. $29.95 (108)

Kote Jack Jelly compound retards oxidation, fungus etc. inherent in low level metal transfer interfaces such as jacks and edge connectors. ½ ounce with applicators and instructions. $5.95 + $1.00 s&h (002)

MK IV Modem Includes smart software for automatic down-loading to printer or memory. Connects to extension phone jack. Simply dial another computer, hang up and it telecomputes. Uses the 8-16K region — 64K RAMs must be able to switch this area "off". Instructions included. $189.95 (008)

PS-1 Power Supply Schematic Schematic of more powerful power supply design. Greater reliability, better line noise immunity. More available power for system expansion. 5 volts and up to 4 amps. $5.00 (068)

Plotter Worksheet (16K) Not a program. Plot screen displays. $6.70 (040)

Programmers Toolkit and Graphics Routines Cartridge (16K-64K) Cartridge plugs between the computer and RAM pack or printer. 4K EPROM mapped into the 12K-16K memory area. Provides 8 programming aids, fifteen graphics commands. Define up to 255 figures. Use all 24 lines of screen. $34.95 + $2.00 p&h (115)

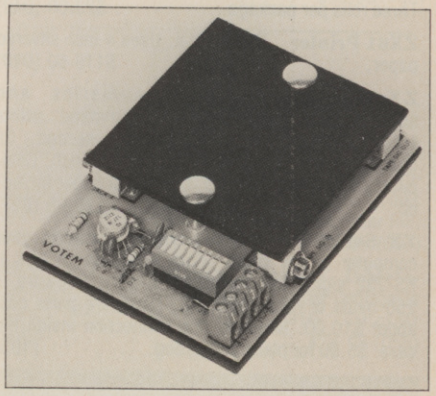
Ribbon Cable Six-inch, primarily for use with 16K RAM modules. Stabilizes RAM against "wobble crashing." Specify female/female or male/female plugs. $19.95 (008)

Samwood Monitor Provides a better picture than a TV monitor. Composite video input/output. Switchable input impedance 75 or 10K ohm. 750-line resolution at center, 500 lines at corners. Orange: 9" $11.90; 12" $127.00. Green: 9" $115.00; 12" $124.00 (086)

UHF Conversion Kit Converts your RF output to channel 33. UHF which is virtually immune to interference. Results in very clear picture. Some soldering. Instructions included. $19.95 (008)

Video Command (Requires AGF Interface or Joystick Port.) Joystick. Can be used with one or two hands. Atari plug compatible. Long cord and easy movement. $16.00 (040)

Votem/Analog Interface High resolution analog interface. Better than 14-bits. Connects to tape input. Expandable voltage range. Includes semiconductor temperature probe and detailed user's manual with software listings. Extra memory recommended. $39.95 Kit (023) $59.95 assembled + $3.00 s&h. User's Manual $5.00 ppd. — applied to first purchase.



ZText — Seikosha Modification Instructions Complete instructions for modifying the ZTEXT word processor program to give 80-character printout on the Seikosha printer. Includes upper and lower case letters and double size printout. $3.00 ppd. (008)

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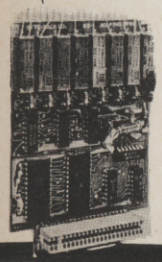

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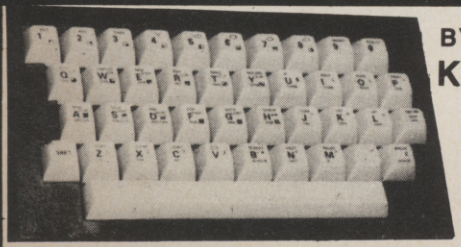

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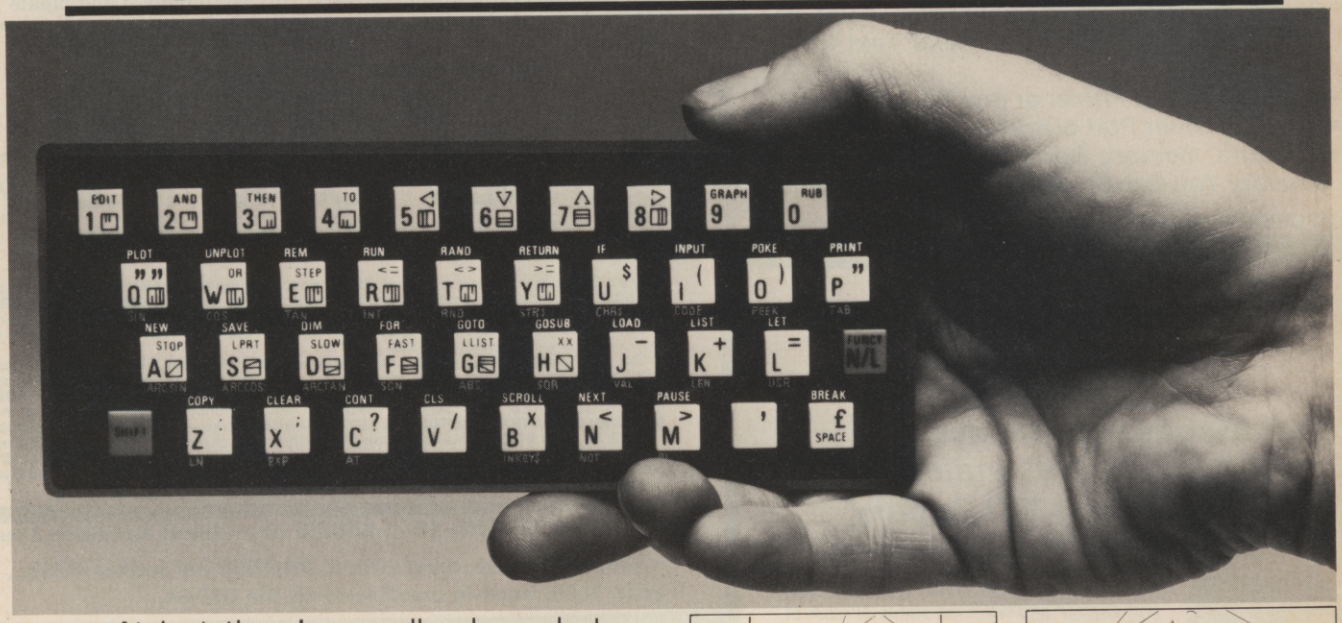

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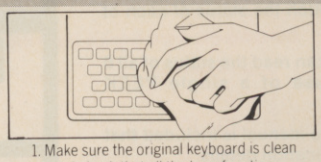

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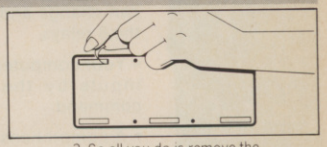
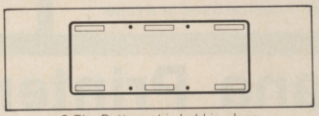
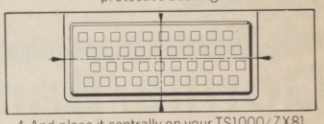


3. So all you do is remove the protective backing.



2. The Buttonset is held in place by self-adhesive pads.



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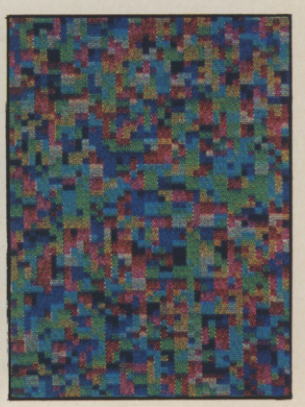

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and much more!

Looking Back And Looking Ahead

IT HARDLY SEEMS POSSIBLE to us here, but this is our seventh issue. The time has flown by and the excitement has just kept increasing. As you and your friends and family do at this time of year, we at *Timex Sinclair User* also have been reflecting on the past year. When we began to get the first issue ready last January, we knew there was a need for *Timex Sinclair User* but what we didn't anticipate was your terrific response and support.

We admit we've made a few mistakes (we wouldn't be a member in good standing of the Timex family if we didn't make mistakes) and some we can almost laugh about now.

Over the past six issues we have enjoyed your letters more than anything else (well, to be honest, there was one that — but we'll forget that one!). Your letters are our lifeline, our connection to the real world, our report card, our handshake with you. Please, as Dean Martin used to say, keep them cards and letters comin'.

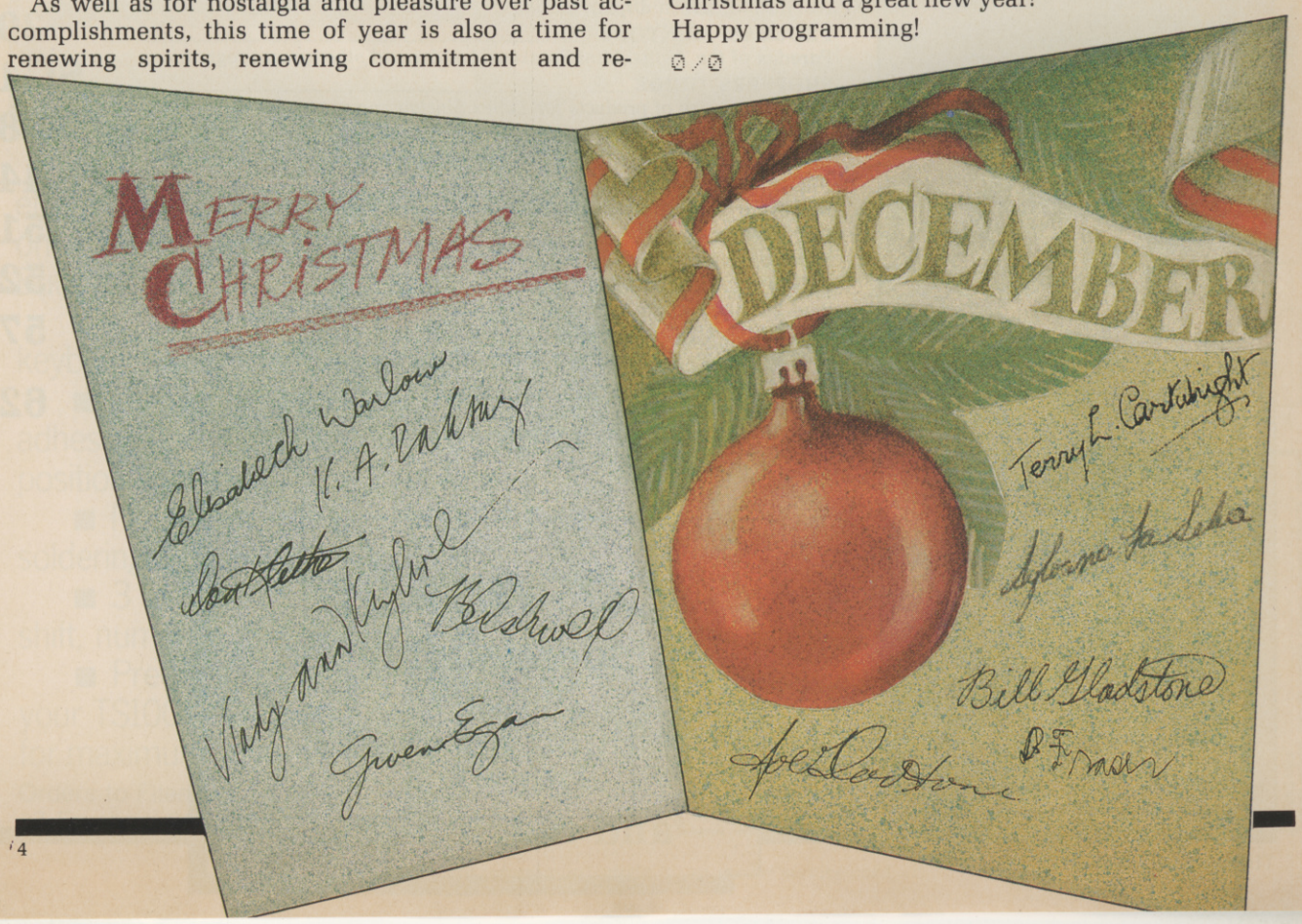
As well as for nostalgia and pleasure over past accomplishments, this time of year is also a time for renewing spirits, renewing commitment and re-establishing goals. At *Timex Sinclair User* we are more enthusiastic than ever over the ideas, articles, offers and special events we have planned for the new year — one example of which is well illustrated by the special program Bob Fraser wrote for you (*see page 11*).

Taking a moment to talk about this issue, I'll just mention *Timex Sinclair User*'s Christmas Shoppers' Guide. It is a separate magazine inside a magazine that can be used to help you with your Christmas shopping. Just about anything you'll need or want for happy and enjoyable computing is listed.

It's interesting that using a computer, which is supposed to be a solitary activity, brings so many people together. Let the so-called experts have their say, but it is abundantly clear to us that computing, rather than isolating us from each other, rather than separating people from other people, does just the opposite. You people are the living proof!

From all of us at *Timex Sinclair User* a very merry Christmas and a great new year!

Happy programming!



Stranded On Mars

Martian Journey

MARS

Aardvark, 16K

This is not a fast action game but an adventure game. It is ideal for someone with a great deal of patience and imagination, and an adventurous spirit. If you have a couple of hours or more to spare, then load it up, sit back and venture into another world.

You are stranded on Mars with a spaceship in need of repairs. Solving one problem seems to lead to various others. You must venture out into the Martian city, collect usable objects, dispose of others, but most of all be very observant. To add to your task, hostile aliens follow you around relocating objects for which you may be searching.

In this text adventure game you use word commands to inform the computer of your actions. GO through various rooms, LOOK carefully at everything, TAKE anything that may be useful, DROP the objects of little value and discover new commands which are helpful in your pursuit.

Chances are great that you won't be able to solve it the first time, as a normal game will run from 30 to 50 hours. Therefore (as noted in the instructions) you must break into the program to save it in progress. It would have been easier if a saving routine had been included in the program. The instructions included are satisfactory as they explain how to play an adventure game in general. Since the program runs in fast mode you may only wish to play it for a couple of hours at a time and then give your eyes a rest.

Putting aside these few faults, I recommend it to those who would like to try their hands at a little adventuring. The hours of enjoyment are well worth the price. ★★★½

For more information, circle 5 on the reader service card.

Not So Super

SUPER INVASION

Softsync, 1K

This space invaders game has been written in fast mode and as a result it produces a constantly blinking screen which is very irritating to the eyes. I was able to play it for only a couple of minutes at a time.

You shoot up at one type of alien while it drops bombs on you. It offers three levels of play: however, once a level is chosen you must reload the game to choose another. Better planning would have produced an acceptable game. ★

For more information, circle 6 on the reader service card.

Othello

REVERSI

Melbourne House, 1K

This is an interesting version of the popular board game, Othello. You play against the computer on an 8 x 8 grid, trying to dominate the board with your color.

The program gives you the option of either making a move which is checked for legality, or passing which can be done to force the computer to move next. Although it is written in machine language you may press the break key to end the game. It also keeps the score; the number of squares you control is displayed alongside the number controlled by the computer.

Though the representation of the pieces is adequate, a better selection of graphics would definitely enhance the game. The instructions included with the program made it easy to learn, as I had never played Othello before. It took me four games to figure out why the computer won each time. Since then, I have been able to consistently beat it. ★★

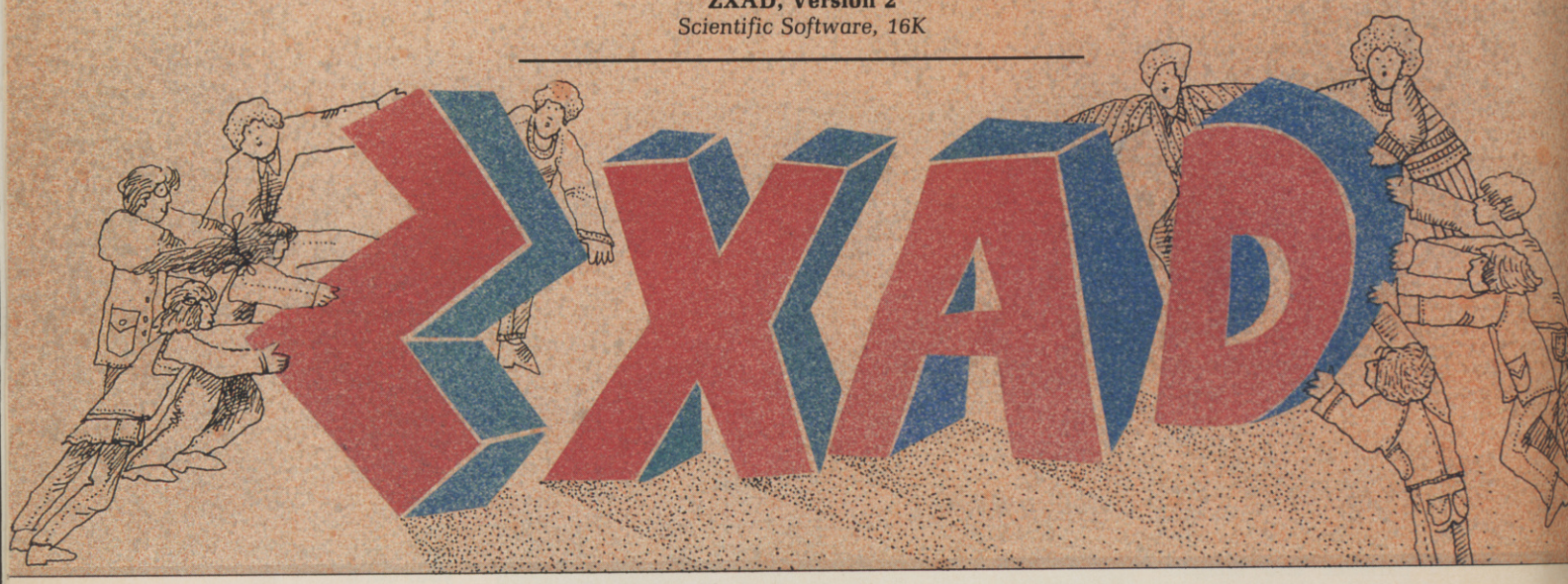
— Greg Brooks

For more information, circle 7 on the reader service card.

Technical Reviews

Assembler is full-featured, easy to use

ZXAD, Version 2
Scientific Software, 16K



ZXAD is an assembler program that includes basic debugging/editing capabilities. It allows the use of eight pseudo-ops (ORG, REL, END, DEFB, DEFW, DEFC, DEFS and EQU) and six-character symbols/labels, something few available assemblers permit.

For those who are unfamiliar with the term, an assembler is a program which aids the user in writing machine code programs. It does this by taking a listing written in assembly mnemonics, called the source code, and translating it into machine code. For example, an assembler takes the source statement "LD A,B" and translates it into the number 78hex, which the Z-80 microprocessor can understand. Using labels, an assembler can automatically calculate addresses, freeing the user from that tedious and error prone task. Programs can be written using statements like "CALL NEXT" or "LS HL, (COUNT)" without worrying about the exact addresses of NEXT and COUNT. Labels make it simple to shift a program about in memory, making it a snap to insert or delete instructions to correct a bug.

A pseudo-op is an instruction included in the source code that tells the assembler what to do, but does not get translated into machine code. The ORG pseudo-op instructs the assembler where in memory to store the machine code as it is being assembled. REL tells where in memory the machine code will be executed. (This is not necessarily the same place that the machine code is stored. The code may get moved.) END signals the end of the source code. DEFB and DEFW indicate that the numbers immediately following them are to be directly included in the machine code. DEFB assumes the numbers are single bytes and DEFW assumes the numbers are two-byte words. These two pseudo-ops are useful in setting up data tables.DEFC causes the character codes of the immediately following string to be stored in the machine code. For example, DEFC "ABC" causes the bytes 26, 27 and 28 (all in hexadecimal) to be included. DEFS leaves open a cer-

Figure 1. *Sample of assemble and print option.*

```
570   53F8 115D40    INPUT LD DE,$
405D
600   53FB D5        INPLP PUSH DE
610   53FC CD3B54     CALL KEY
620   53FF D1         POP DE
625   5400 E1         POP HL
630   5401 FEE3       CP $E3
640   5403 CABF53     JP Z,MENDIS
650   5406 E5         PUSH HL
660   5407 FE77       CP $77
670   5409 281A       JR Z,DEL
680   540B FE76       CP $76
690   540D 2829       JR Z,ENT
700   540F FE40       CP $40
710   5411 30E8       JR NC,INPLP
720   5413 EB         EX DE,HL
730   5414 77         LD (HL),A
740   5415 23         INC HL
750   5416 117B40     LD DE,$407B
760   5419 B7         OR A
770   541A ED52       SBC HL,DE
780   541C 2817       JR Z,WSFULL
```

tain number of bytes which can then be used for temporary storage. EQU assigns a numerical value to a symbol or label.

Symbols are strings of up to six characters used in the source code to represent constant numbers. For example, the symbol LINES can be used in place of the number 16hex in the instruction LD A,LINES. Symbols make the source code easier to understand while also providing a way to change the value of a constant throughout the program (by changing one EQU statement).

The number of symbols/labels that can be used in the source code is only limited by the size of free memory.

The first line of ZXAD is a REM statement that contains the machine code that actually handles the conversion from source code to machine code and the debugging/editing. The 102 remaining lines of BASIC create the display and gather input from the user. Including the display file, ZXAD occupies just over 8K bytes of memory.

The user's source code statements are stored in REM statements above ZXAD's 103 lines. One source statement plus a comment are allowed per REM. ZXAD has a line renumber function which makes it simple to insert new lines of source code.

ZXAD offers three assembly options. One simply assembles the code and displays any error messages; the others, assemble the code and either display or print out addresses, machine code, source code, and error messages (see Figure 1).

ZXAD provides simple debugging features. Memory can be examined and edited in hex. Also a breakpoint address can be selected. When this address is reached during a run of the machine code, a branch is made to a routine that displays the values of all the registers. The machine code program does not stop after the breakpoint — it continues on leaving a snapshot of the Z-80's state at that address. ZXAD does not provide the single-step or disassembly capabilities found in other debugging programs such as Sinware's HOT Z.

ZXAD is very easy to use. Source code is standard Z-80 mnemonics, but uses only hexadecimal numbers. Functions are selected from a menu (see Figure 2). The instruction booklet is very well written, though it assumes a familiarity with machine language programming. It includes tips about the most common programming mistakes and contains a list of all the mnemonics in the form that ZXAD recognizes.

My only complaint about ZXAD concerns the five error messages: they are not specific enough. "BAD OPCODE" can mean everything from a missing space to an incorrect number. This vagueness can be frustrating until you become familiar with ZXAD's syntax.

Overall, the ZXAD assembler is very useful, full-featured, and easy to use. Its instructions are clear and complete. It has some debugging/editing capabilities, but it is not a complete debugger/disassembler.

— Allan C. de Frates

For more information, circle 8 on reader service card.

Figure 2. *Function menu.*

```
SCIENTIFIC SOFTWARE

ASSEMBLER/DEBUGGER V2

A  ASSEMBLE
L  ASSEMBLE AND LIST
P  ASSEMBLE AND PRINT
R  RENUMBER SOURCE
D  DEBUG
Q  QUIT

ENTER CHOICE:
```

Machine Code Tape Offers Seven Utilities

MACHINE CODE TEST TOOL

Oxford Computer Publishing, 16K

There are several programs of this nature on the market. They are sometimes referred to as debuggers since their main purpose is to perfect machine language programs. This one is fairly short and locates itself automatically above RAMTOP, leaving the program area entirely free. It's about 1,700 memory-bytes long and offers seven utilities: hex to decimal conversion, and vice versa; a loader that allows you to enter 1 byte hex numbers sequentially from a given address; a breakpoint facility; a routine that displays register contents; a memory display function that screens the contents of 120 addresses as characters and hex numbers; and, finally, a function to execute your routines from within the program.

The main qualities of Machine Code Test Tool: small size, ease of use, and clear documentation. It's debugged and difficult to trip up, which is more than most programs of this type can claim. Its faults: a lack of flexibility in implementing the available functions, and the omission of many features found on larger programs such as a disassembler, block manipulation, search & replace, and so on. This makes the program viable, strictly for the beginner who is interested in short machine code subroutines in a BASIC framework. The documentation included with the cassette supports this argument. In a nutshell, the Machine Code Test Tool is well designed, compact and "user friendly," but its limited features restrict its use to the beginner.

— André Roussil

For more information, circle 9 on reader service card.

Letters

Keyboard Winner

I was sorry to see that in "6 Keyboards compared" (Issue 3) you did not include the Suntronics KD-81 keyboard. This keyboard is far superior to any I have seen with 41 keys, including two shifts and a full space bar, touch-typing is quite possible. It's an excellent buy at only $69.95.

I must also commend Suntronics on their great customer service. Being a Canadian, mail orders usually take four or five weeks to reach me. Suntronics had it at our post office in less than two. All in all, a company well worth associating with.

James Hands
Calgary, Alberta

Thanks for updating that information for our readers, James. The six keyboards we chose certainly did not exhaust the market. As new information reaches us, we will be sure to pass it on to our readers. Keep us informed about what else is happening regarding Timex Sinclair Canada.

Suntronic's address is 12621 Crenshaw Blvd, Hawthorne, California 90250.

Disk-Drives

First, let me thank you for your outstanding magazine. My question I'm sure concerns many T/S,ZX owners. For over a year there have been rumors of a disk-drive for the T/S1000,ZX81. In your third issue I read an article about microdrives for the 2000 series. Are we T/S1000 owners being phased out? I am pleased with my T/S1000 and Timex in general and would like to stick with them. I asked Timex about the "rumor" and they seemed to indicate a disk-drive was in the works. Since then I can't seem to get clear responses to the question. Do you know anything about it?

P.S. Please keep those projects coming!

William Cushman
Panama City, Florida

We have heard the "rumors" also and like you can't seem to get a clear answer from Timex. Maybe someone at Timex reading this will give us a call and set the matter of disk-drive for Timex computers straight. Until then we'll have to wait and see.

What about one of you out there coming up with an answer to this problem — maybe a project or a simple solution!

And we intend to "keep those projects" coming. If any readers have projects they would like to share, please send them to us for consideration.

Learning T/S BASIC

I'm interested in purchasing the book *Learning Timex Sinclair BASIC* by David A. Lien, which Fred Blechman reviewed in Issue 4. Will you please print the address of its publisher?

John R. Kappes
Garden Grove, California

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Letters

Lien's book is published by Compusoft, whose address is 535 Broadway, El Cajon, California 92021. It is available in stores for $14.95. Hope you enjoy it as much as Fred Bleckman did.

Spectrum Information

I am writing for information on the Sinclair Spectrum computer. Can I get a Joystick for the Spectrum? A Disk-Drive? A modem? Also I would like more information on its compatibility, capabilities for games and education, memory, graphics and price. How soon can I order the Spectrum and what is the subscription price of your magazine and is it monthly or weekly?

Jamie Windsor
Sydney, Nova Scotia

The Spectrum is a British computer, built to work with British televisions and power supplies. Spectrum will not work in North America without many modifications.

Timex is bringing out a North American version (a much improved machine) of the Spectrum, the T/S2068. It was reviewed in Issue 4. It will take a joystick, a disk drive, a modem, and much more. As more information about the machine becomes available, we will publish it.

To subscribe to Timex Sinclair User, *just fill out the card at the front of the magazine and send it in. Thanks for writing.*

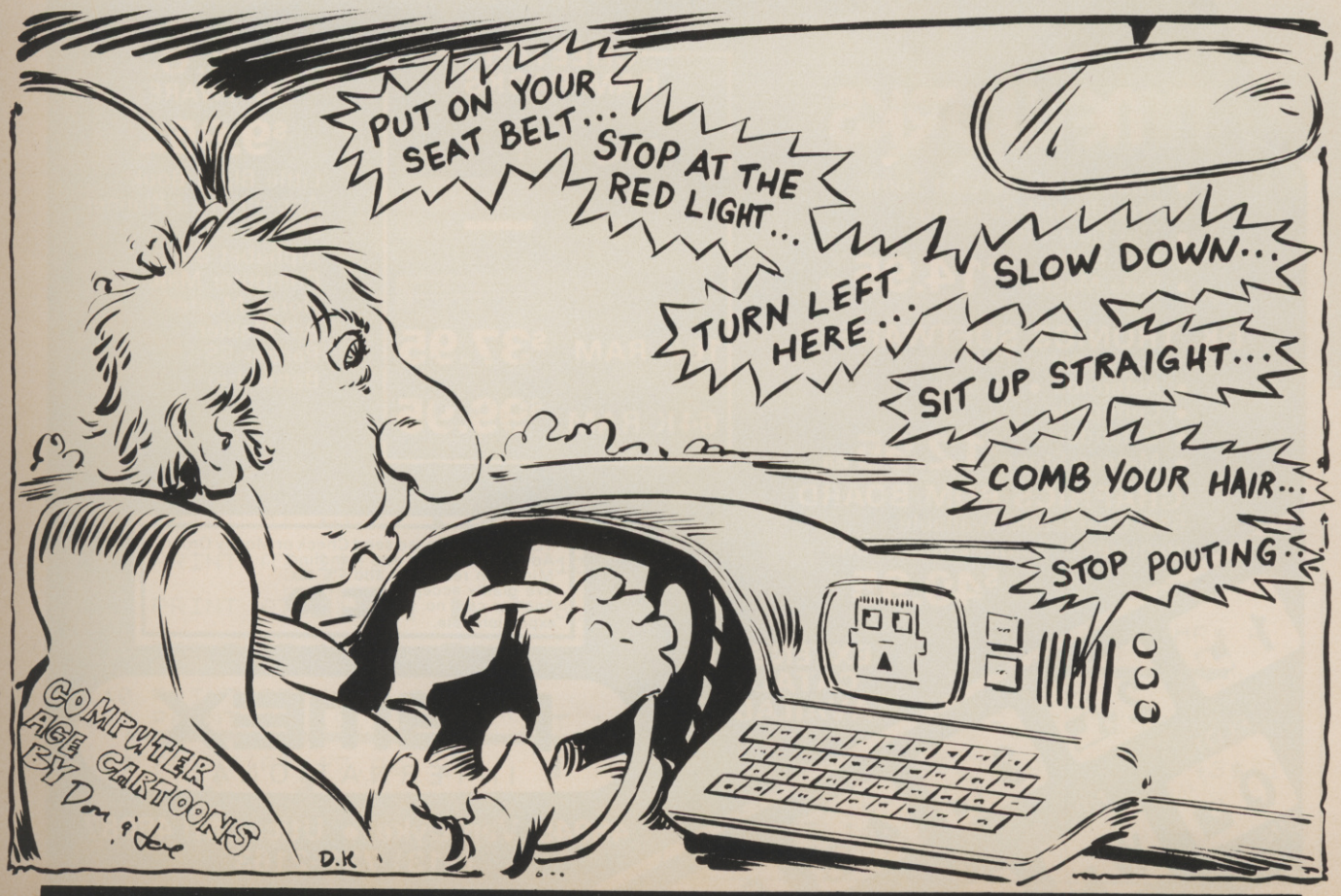
3D Xs and Os

Many of you informed us that the program "3D Xs and Os" in our September issue (TSU 1:4) was incompletely listed. In our haste to bring you this program, we omitted most of it, so that it ended with line 240 and not 1090. Timex Sinclair User apologizes for any inconvenience this may have caused. The complete listing is among the Program Printouts in this issue.

Arcade Corrections

Numerous errors crept into Part I of Bob Fraser's "Programming Arcade Games" in our October issue (TSU 1:5). Line 40 of Figure 1 should read POKE *I + D + 1, 23. The third paragraph on page 61 should refer to Figure 2A, not 3. Figure 3 should contain the line 1005 PRINT AT R,I," ". In line 40 of Figure 2, C<>2; in line 50, C<>29; in line 60, add blanks before and after the asterisk (also in Figure 2A). In line 55 of Figure 2A, R<>1; in line 56, R<>18; in lines 58 and 59, add three blanks between the quotation marks. Line 1006 of Figure 3 should end with a semicolon; line 2010 should contain four blanks between the quotation marks; and line 2020 should read* GOTO *20.*

As a result of these errors we have instituted another stage of proofreading to ensure that similar errors do not recur. We apologize to our readers.



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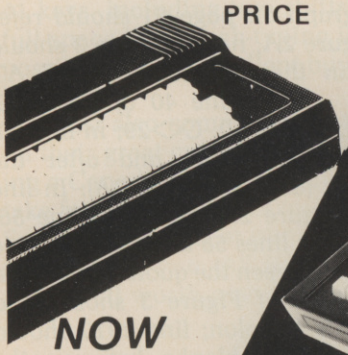

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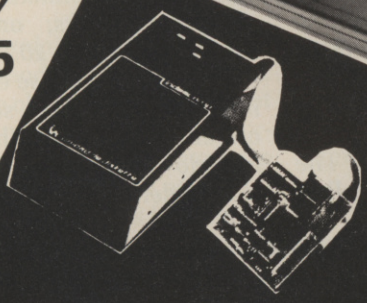

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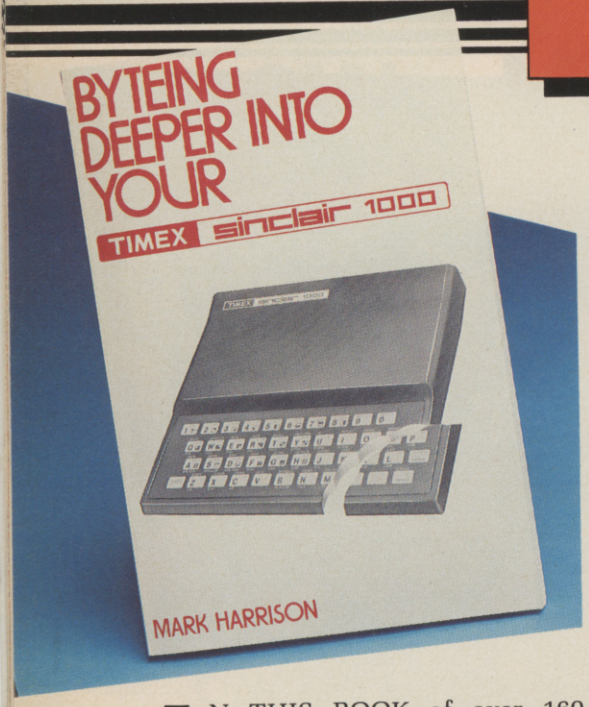
CHRISTMAS PROGRAM

THIS PROGRAM may or may not help your programming skills. This program may or may not teach you a new programming technique. This program may or may not intrigue you for hours and hours. What will this program do for you? Run it and see! We know this program will do a great deal for us. It will provide a Christmas link between us here and you out there! 0/0

```
  10 DIM S$(160)
  20 LET S$="  *     *        *     *
     *       *     *     *
  *     *   *     *     *
*     *       *   *   *     *
*   *     *           *       *
   *     *     *"
  30 LET Z$="
"
  40 PRINT AT 5,8;"D5IIP  38I9JK
D1J"
  50 PRINT AT 7,14;"1E4"
  60 PRINT AT 9,9;"81GGP E5N P51
I"
  70 PRINT AT 11,8;"6IFD 5M5IPPE
5 1K"
  80 PRINT AT 14,3;"  ";AT 15,3
;"  ";AT 16,3;"  ";AT 17,3;
"
  90 PRINT AT 20,3;"
"
 100 PRINT AT 13,3;" ";AT 12,3;"
 "
 110 PRINT AT 11,2;"  ";AT 10,1;
"  "
 120 PRINT AT 9,1;"  ";AT 8,1;"
  "
 130 PRINT AT 12,27;"■";AT 7,2;"
■"
 140 PRINT AT 21,0;Z$
 150 PRINT AT 19,28;"  ";AT 18,
4;"                          "
 160 PRINT AT 17,22;"      ";AT
 16,23;"    "
 170 PRINT AT 15,24;"    ";AT
14,25;"   ";AT 13,26;"  "
 180 PRINT AT 18,11;" ";AT 19,10
,"  ";AT 20,9;"  "
 190 LET A=165+PEEK 16396+256*PE
EK 16397
```

```
 200 FOR L=1 TO 4
 210 FOR I=1 TO 33
 220 IF PEEK (I+A)>28 AND PEEK (
I+A)<56 THEN POKE (I+A),9+PEEK (
I+A)
 230 NEXT I
 240 LET A=A+66
 250 NEXT L
 260 POKE A+14,57
 270 POKE A+15,27
 280 POKE A+16,56
 290 POKE A+17,27
 300 POKE A+18,58
 310 POKE A+19,27
 320 LET R=135+INT (RND*4)
 330 PRINT AT 0,0;S$(1 TO 160)
 340 PRINT AT 6,8;"
  ";AT 14,13;"  "
 350 PRINT AT 12,27;"*";AT 7,2;"
*"
 360 LET Z$=Z$(2 TO 32)+CHR$ R
 370 PRINT AT 6,8;"
   ";AT 10,9;"                "
 380 PRINT AT 21,0;Z$
 390 PRINT AT 12,27;"■";AT 7,2;"
■"
 400 LET S$=S$(129 TO 160)+S$(1
TO 128)
 410 PRINT AT 10,9;"
   ";AT 14,13;"  "
 420 GOTO 320
```



More Than One Can Chew

Byteing Deeping Into Your Timex Sinclair 1000,
by Mark Harrison
(John Wiley & Sons, Inc., $12.95)

IN THIS BOOK of over 160 pages with 37 programs of varying difficulty, Mark Harrison begins with a one page listing of the ZX80 and ZX81. The object of the book is to teach BASIC. This is handled in a rather difficult manner.

If, like most people, you bought a T/S1000 or ZX81 first, the first chapters on the principles of computer systems and the formation of algorithms will leave you wondering just what is going on here. The language, style and purposes are more suitable for a university-level text than a home instruction book.

The language remains difficult throughout, but the explanations of BASIC, specifically ZX81 BASIC, are well thought out and divided into logical groups under such headings as Statements, Functions, Character Sets and String Functions, Graphics, Logic and INKEY$.

It is in these areas that this book has its greatest use. These are the sections that any book about a computer and BASIC must cover, and they are handled very competently.

Harrison then discusses the memory of the T/S1000,ZX81 and PEEKing and POKEing. The explanations and illustrative figures serve their purpose, but a strong background in mathematics is required to fully grasp the discussion in the text. If such phrases or topics as "exponent byte" and "mantissa byte" and "pushing and popping" leave you with a worried expression, this is not the book for you.

However, it is in this section (just past the mid-point) that the most original and useful programs are found. If you've tried programming arcade games, you may have discovered a need for a timer — in real units. There it is — an elegant, concise listing (six lines) that can be adapted to your own needs.

This section also includes an overview on machine code programs. If you don't know much about this language form and would like to, this is an overview ". . . not really intended to teach the writing of machine code programs but to show the ZX81 (T/S1000) user how to execute and possibly understand other people's machine code programs."

This may work for you, but it didn't for me. If I hadn't known anything about it before I had read this section I would have hit the frustration point. Machine code programming cannot be covered in ten pages and accomplish the goals set by Harrison.

The remaining few chapters cover loading and saving, crashing and programs. In summary, I believe that this is a book to look at very carefully before you buy it. Other books do a better job in terms we can all understand. Now don't get me wrong — this is not a bad book. The tips and programming devices are excellent, but — and it's a big but — I wouldn't buy it. The last thing my bookshelf needs is another book whose title implies I can really get into my computer and whose purpose is to help me learn BASIC but whose contents break the promise of the title and whose language forces me to read to make sure I really don't understand what I don't understand. This one's not for me.

— George Miller

You need a strong background in math to understand the text

The Anatomy o

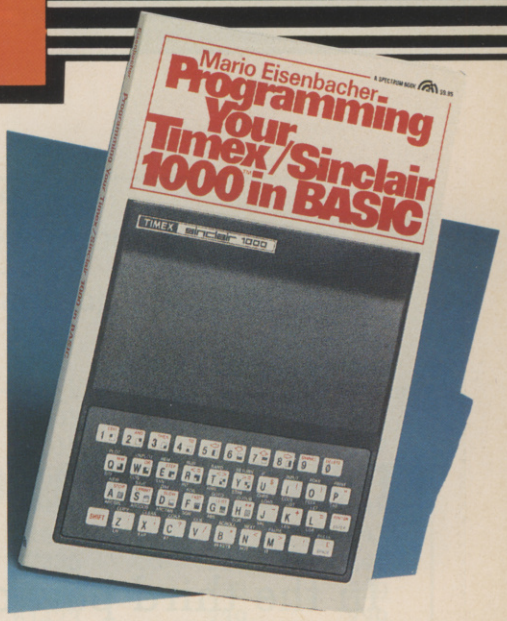
The Ins and Outs of the TS 1000 & ZX 81,
by Don Thomasson
(Melbourne House, $12.95)

THIS BOOK will be a long awaited pleasure for anyone who wishes to soup up his T/S1000,ZX81 with internal modifications or add-on homebrew peripherals. For those of us utterly unfamiliar with electronic hardware, *The Ins and Outs* might be a bit rough-going at first, but the author makes every effort to present the material in terms that lead to an understanding of the concepts and projects presented. Tinkering with the innards of a computer is something that most of us are understandably nervous

Books

Programming Primer a Peach

Programming Your Timex/Sinclair 1000 in BASIC, *by Mario Eisenbacher (Prentice-Hall, $9.95)*



THE BOUNDLESS enthusiasm that Mario Eisenbacher manages to instill in his book is all too rare in the computer book industry. The typographical errors and minor inconsistencies are there but this supplementary programming manual is well laid out and somewhat more carefully planned than many of the slap-dash efforts we've seen appearing on the bookshelves in the last year or so.

Although the choice of sample programs is at times a bit unimaginative (yes folks, another version of Hangman), the author is once again saved by his technique. When you first come across a program, it is written in such a way as to include many of the typical programming errors to which the novice generally falls prey. When these faults become obvious, the reader is gently steered in the right direction with a revised version of the program at hand. The new program is itself not usually perfect, but through several levels of correction, Eisenbacher gradually brings it all together. Another decisive point in this book's favor is the use throughout the text of boxes, offset from the body of type, containing hints, notes, rules, reminders and simple point of interest or importance which break up the book and make it a little easier to read.

As a learning tool, the T/S1000,ZX81 has always struck me as a good bet, even for children. The small size and low cost of the unit are important, as are its relative indestructibility and the straightforwardness of the BASIC language resident in the machine. In *Programming Your Timex/Sinclair 1000 in BASIC*, we find a book that goes hand in hand with the concept. The many exercises in the book are clever and well-aimed; a table of answers is provided at the back, a change from many of the textbooks currently available.

If you are unfamiliar with programming and feel a bit queasy about plunging in unassisted, I recommend Eisenbacher's book as a supplement to help you over some of the rough spots in the T/S manual. If you are seeking a text to assist in teaching children to use the T/S,ZX, this book is definitely worth considering.

— Tom Sommerville

a Microcomputer

about, but Thomasson treats the subject in such a matter-of-fact way that after a few pages even the most reluctant of us will be itching to take the cover off and get inside with a soldering iron.

The first section is devoted to a careful study of the internal layout of the machine. Thomasson discusses the various signals zipping around inside the little black box, how they affect each other, and finally suggests some practical changes to the interior decor. Any of us who have suffered from the dreaded Rampack Wobble will find irresistible a project designed to install RAM (random access memory) chips inside the T/S,ZX. The middle section of the book provides a concise description of the signals available along the edge connector at the back of the machine; this leads quite naturally to the third and final portion, which deals with the addition of external circuitry to the computer. In a book as small as this one it is impossible for the author to cover every possible type of interfacing and to his credit Don Thomasson has not attempted to do so. His approach instead is to start with extremely general advice, and through selected examples of varying difficulty, lead the reader to his or her own solutions to specific application problems.

An aspect which for me justifies the purchase of *The Ins and Outs of the TS/1000 & ZX/81* is the very useful (if sometimes roughly drawn) diagrams which are to be found throughout. I was also excited by the final project in the book, which describes a complete control system for a model railway. This is the sort of thing that starts one thinking about the computerized home of the future; with the circuits and techniques presented here, it could be yours sooner than you think.

— T. S.

Programming Arcade Games III

The articles in this series are excerpts from the book, "'Programming Arcade Games," soon to be published by Reston Publishing of Reston, Virginia

Instantaneous Keyboard Response

In the third part of his series, Bob Fraser explains how to tell what key has been pressed using machine language

IN THIS SEGMENT we will look at various ways to find out which key, if any, is being pressed. In an arcade game, this information must be found quickly and efficiently. We will show you different methods of inputting. You select the one that best suits the needs of the particular game you are developing.

How Important?

Arcade games are fun because a player's input determines the outcome of the game. Imagine playing an arcade game without player input. You helplessly watch your spaceship get bombed by enemy fire while your score remains at zero. You want to blast into hyperspace or set up a defector shield. An enemy spaceship swoops down blasting lasers at your unprotected vessel. As your only means of escape, you yank out the power supply to your computer, ending the senseless slaughter.

The above scenario is an exaggeration. Most games allow for input, but if it is not done in the best possible way, the game may be ruined. Games can have too little or too much input. They can be too complicated or too simple. The input methods used in any game require careful planning.

Selecting the Appropriate Input Keys

There are two important points to

consider when selecting which input keys to use for a game:

1. A player will become frustrated with a game that requires memorizing the use of too many input keys. Most games work best if the number of input keys is kept to four or less.

2. Input keys that have a mnemonic, symbolic or positional meaning are best. A poor selection, such as using "Z" to mean right and "N" to mean left, will confuse the players and make the game more confusing and difficult.

Keyboard Scanning Monitor Routine

One method of inputting data in a machine language program is to use a keyboard scanning routine located in the monitor. This routine returns a code in the HL register pair which represents the status of the keyboard.

The scanning routine is summarized below.

Address Location: 699 Decimal (2BB Hexadecimal)

Method of Use: 205 CALL SCAN
187
2

Input: Nothing

Output: Key code stored in HL register pair (see keyboard scanning codes table).

Caution: The scanning routine uses registers A,B,C,D,H and L. Any numbers previously stored in these registers will be lost! If you need them for future use, save them on the stack or at a different address location in memory.

The table of key codes shows the values returned to the HL register pair by the scanning routine. Register L equals 255 only when a key has not been pressed. Therefore, a single compare instruction can determine if a key has been pressed. The following routine illustrates this method.

Example: Waiting for a key to be pressed.

Table of Key Codes Returned By Scanning Routine

Key	*HL Hex. Value*	*HL Dec. Value*	*H Value*	*L Value*
No key	FFFF	65535	255	255
1	FDF7	65015	253	247
2	FBF7	64503	251	247
3	F7F7	63479	247	247
4	EFF7	61431	239	247
5	DFF7	57335	223	247
6	DFEF	57327	223	239
7	EFEF	61423	239	239
8	F7EF	63471	247	239
9	FBEF	64495	251	239
0	FDEF	65007	253	239
A	FDFD	65021	253	253
B	DF7F	57215	223	127
C	EFFE	61438	239	254
D	FDF7	63485	247	253
E	F7FB	63438	247	251
F	EFFD	61437	223	253
G	DFFD	57341	223	253
H	DFBF	57279	223	191
I	F7DF	63455	247	223
J	EFBF	61375	239	191
K	F7BF	63423	247	191
L	FBBF	64447	251	191
M	F77F	63359	247	127
N	EF7F	61311	239	127
O	FBDF	64479	251	223
P	FDDF	64991	253	223
Q	FDFB	65019	253	251
R	EFFB	61435	239	251
S	FBFD	64509	251	253
T	DFFB	57339	223	251
U	EFDF	61407	239	223
V	DFFE	57342	223	254
W	FBFB	64507	251	251
X	F7FE	63486	247	254
Y	DFDF	57311	223	223
Z	FBFE	64510	251	254
EDIT	FCF7	64759	252	247
AND	FAF7	64247	250	247
THEN	F6F7	63223	246	247
TO	EEF7	61175	238	247
←	DEF7	57079	222	247
↓	DEEF	57071	222	239
↑	EEEF	61167	238	239
→	F6EF	63215	246	239
GRAPHICS	FAEF	64239	250	239
RUBOUT	FCEF	64751	252	239
" "	FCFB	64763	252	251
OR	FAFB	64251	250	251

Decimal Code	Mnemonics	Purpose
205	WAIT: CALL SCAN	Store keyboard response in HL
187		
2		
62	LD A,255	Set register A to 255
255		
189	CP L	Compare L to A
40	JR Z,WAIT	Jump to WAIT if A=L
248		

Here is another example of keyboard scanning. Suppose that a game used the 5 key to call a routine to move left and the 8 key to move right. The following input routine shows an efficient method of doing this.

Decimal Code	Mnemonics	Purpose
205	CALL SCAN	Check keyboard for a response
187		
2		
175	XOR A	Clear A register
17	LD DE,57335	Set DE to code for 5
247		
223		
229	PUSH HL	Save HL on the stack
237	SBC HL,DE	SBC affects the zero flag
82		
225	POP HL	Restore HL
202	JP Z,left	Jump to left routine if the 5 key was pressed
-		
-		
17	LD DE,63471	Load DE with the code for 8
239		
247		
237	SBC HL,DE	SBC affects the zero flag
82		
202	JP Z,right	Jump to right routine if the 8 key was pressed
-		
-		
201	RET	Return to calling routine

Example: Input routine – 5 = left, 8 = right

The previous routine uses the SBC instruction to test the value of a large number. The zero flag will be set if the result of the subtraction is zero (if HL = DE). This is the most efficient method of testing the value returned by the scanning routine.

Table Of Key Codes Returned By Scanning Routine, continued

Key	HL Hex. Value	HL Dec. Value	H Value	L Value
STEP	F6FB	63227	246	251
<=	EEFB	61179	238	251
<>	DEFB	57083	222	251
>=	DEDF	57055	222	223
$	EEDF	61151	238	223
(	F6DF	63199	246	223
)	FADF	64223	250	223
"	FCDF	64735	252	223
STOP	FCFD	64765	252	253
LPRINT	FAFD	64253	250	253
SLOW	F6FD	63229	246	253
FAST	EEFD	61181	238	253
LLIST	DEFD	57085	222	253
**	DEBF	57023	222	191
-	EEBF	61119	238	191
+	F6BF	63167	246	191
=	FABF	64191	250	191
FUNCTION	FCBF	64959	252	191
:	FAFE	64254	250	254
;	F6FE	63230	246	254
?	EEFE	61182	238	254
/	DEFE	57086	222	254
*	DE7F	56959	222	127
<	EE7F	61055	238	127
>	F67F	63103	246	127
,	FA7F	64127	250	127
↑	FC7F	64639	252	127

Input: Using A System Variable

The system variable LAST K contains the key code of the last key pressed. This can be used for inputting the same way the scanning routine was used.

The variable LAST K is located at address 16421. It is two bytes in length. The instruction:

LD HL,(16421)

has the same effect as CALL SCAN.

While the computer is executing a BASIC or machine language program, it continues to send an output to the television and scan the keyboard. This is done by periodically interrupting the program and moving to a routine that produces an output display and executes the scanning routine. It is the scanning routine which updates the LAST K variable.

The example below calls a routine called PRINT only if a key has been pressed.

Input: Example using LAST K.

Decimal Code	Mnemonics	Purpose
42	LD, HL,(16421)	Store key code in HL
37		
64		
62	LD A,255	Let A = 255
255		
189	CP L	Compare L to A
196	CALL NZ,print	Call print routine if L < >A
-		
-		

Monitor Decoding Routine

To print the character of the key pressed, it is necessary to decode the value returned by the scanning routine. The monitor decoding routine can be used to translate the key code into a printable BASIC code. For example:

Key Value	*BASIC Code*	*Key*
65007	28	O
63485	41	D
64510	63	Z

The information needed to use the decoding routine is summarized below:

Address Location:	1981 Decimal (7BD Hexadecimal)
Method of Use:	205 Call DECODE 187 2
Input:	Key value stored in BC register pair
Output:	Address of location containing BASIC character code stored in HL

The BASIC codes for all of the printable characters are stored consecutively in memory starting at address location 125. The decoding routine finds the address of the BASIC code that matches the key value stored in the BC register pair.

The following input example waits for an input response, decodes the response and stores the resulting BASIC code in the A register.

Example: Decoding an input response:

Decimal Code	*Mnemonics*	*Purpose*
205	LOOP: CALL SCAN	*Store keyboard response in HL*
187		
2		
62	LD A,255	*Set A to 255*
255		
189	CP L	*Compare L to A*
40	JR Z,LOOP	*Continue in loop until a key is pressed*
248		
68	LD B,H	*Let B = H*
77	LD C,L	*Let C = L*
205	CALL DECODE	*Decode input response*
189		
7		
126	LD A,(HL)	*Load resulting BASIC code in A*

Note: Do not call the decoding routine unless a key has been pressed. If the BC register pair contains 65535 (code for no key pressed) the system will crash after entering the decoding routine.

Next month we will look at one of the most important elements of arcade games — the video display.

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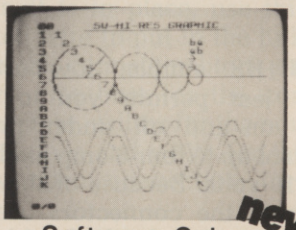

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Project

An Illuminating Idea

Let your T/S,ZX control the blinking of the lights on your tree this Christmas. The Power Card, Dave Buckley explains, can also be used year-round for other switching applications

THIS simple, low-cost project permits you to switch on and off under program control up to four 5 amp loads at up to 110 volts. Because of the limitations of the connectors used, the total of the four loads should not exceed 5 amps.

The Power Card is controlled via any user output port such as the Latch Card. It is designed to be plugged right into the Latch Card. An interface is required between the Power Card and the T/S,ZX, and, in lieu of the Latch Card, any interface that will provide an 8-bit output (one only) will do the job; there must be a dozen such devices available.

Suitable applications for the Power Card include switching lamps, aquarium heaters, electric motors, cassette recorders, and model railway points. The warning is that it should not be used to switch unattended electric heaters. If you build it in time, you can dazzle and amaze your friends and neighbors by using your computer to control your Christmas tree lights. Used with an add-on sound board, you could even have your lights flash in time with music, such as Christmas carols.

You will see that the circuit board has been mounted in a stout plastic Perfcase; that is essential if the Power Card is to be used to switch mains voltages. On the other

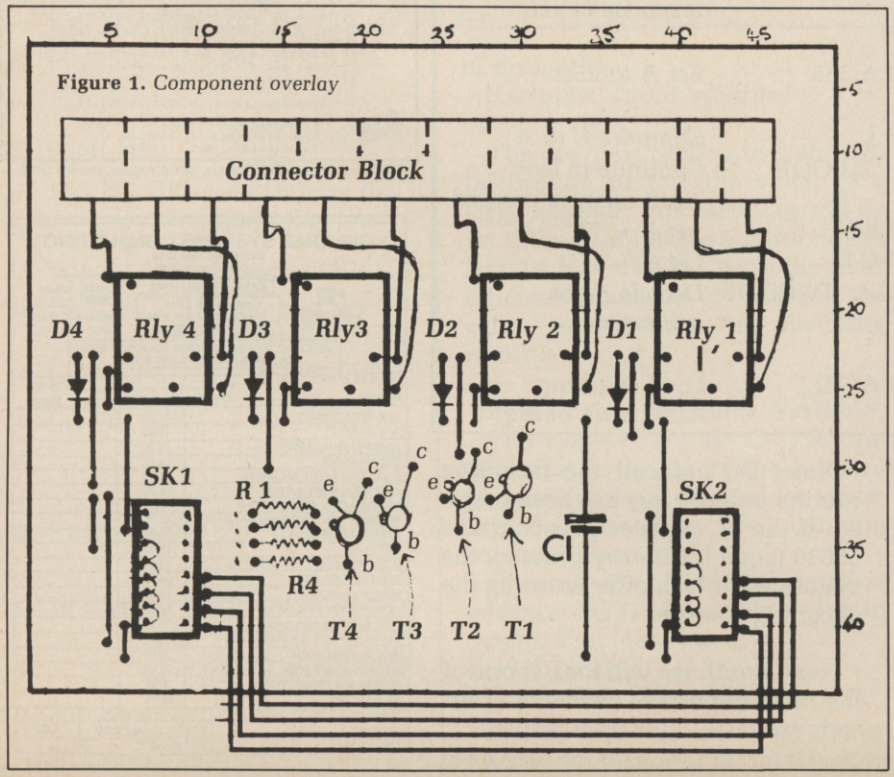


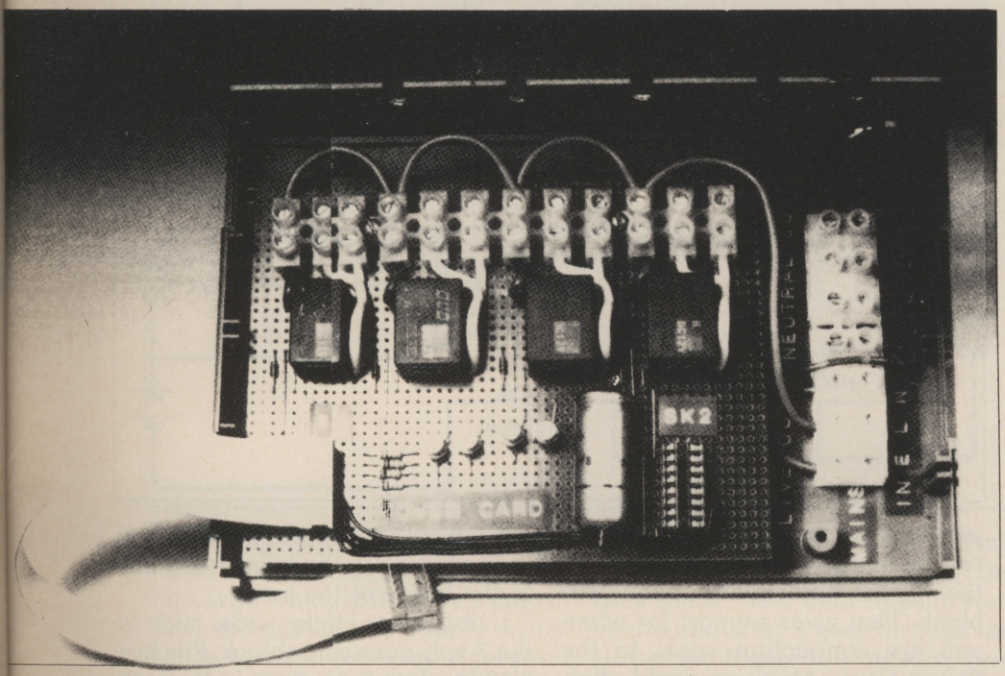
Figure 1. *Component overlay*

COMPONENTS

Qty	Item
2	16-pin dual in-line socket — SK1, SK2
1	Perfboard 3¾-in. x 5-in. (10347)
4	10 amp change-over 12V coil relays — Rly 1 . . . Rly 4 (10 amp mains relay — VX97F)
4	BC107B transistors — T . . . T
4	1 Kohm resistor — R . . . R
4	1N914 diode — D . . . D
1	100m 16V capacitor — C
1	6BA solder tag
1	12-way connector block (5 amp rating)
1	7-way connector block (5 amp rating)
1	Perf. case 202-21037L type 214 180mm. x 120mm. x 40mm. connecting wire

To connect the Power Card to a user port you need either two 16-pin dual in-line header plugs and one 1-ft. 16-way ribbon cable or one 16-pin DIL plug to 16-pin plug cable assembly. The header plugs and ribbon cable should be available from any good component shop.

Note: If Vero products are not available from your local supplier, you may substitute Vector, GC or similar manufacturer's products.



hand, if you are to use it only to control your model trains, the box can be omitted and the cost of the project will be almost halved.

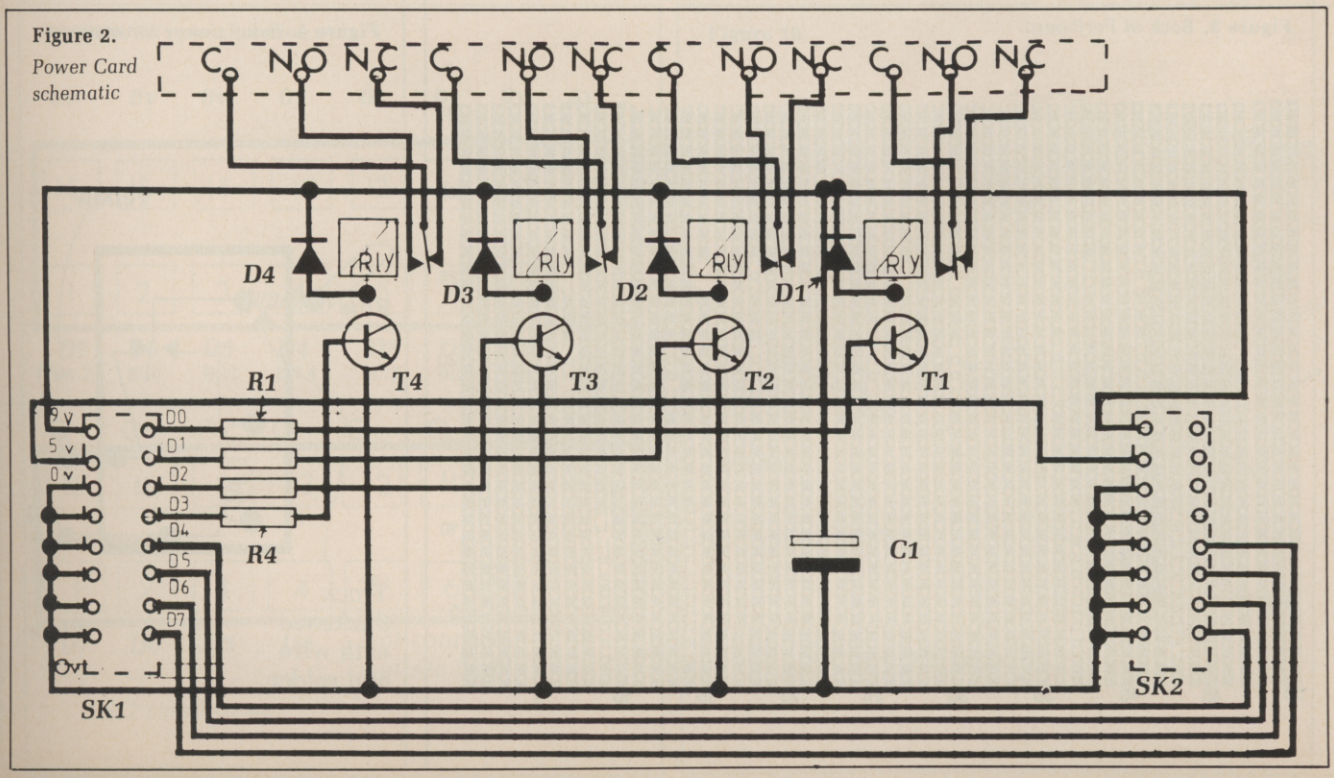
The Power Card is built on a standard-sized piece of Perfboard. Insert the big components in the correct place in the Perfboard using the component overlay diagram in Figure 1 as a guide, and solder them in place. Then work your way down to the small components; it is easier to have the locations correct that way.

When all the components have been soldered in place and the excess leads have been cropped off, use a 1/8-in. twist drill held in your fingers to cut the tracks in the places indicated. Although this is the opposite way of constructing things from that usually recommended, if the tracks are cut before fitting there is great difficulty in finding the correct locations.

Having fitted all the components, mount the 12-way connector block using two 6BA nuts and bolts or stick it down using sticky pads. When it is in place, use thick insulated wire to put in the links between the connector block and the relays. Use blue for the common connectors, yellow for the normally closed ones and white for the normally open connection on each relay.

Where the links enter the Perfboard, make sure that there is a good solder connection between the link and the relay connection. For the normally open connection (white), lay an offcut of component wire along the track between the

Figure 2.
Power Card schematic



white link and the relay connection and solder it in place to give a good, thick connection. Vero-tracks by themselves will burn out if you try to put 5 amps through them.

The Power Card uses only the lowest four bits of the output latch so you can use the upper four bits to control something else. If the unused upper four bits is routed along with the 9V, 5V and 0V lines to SK2, you can plug in something else there — perhaps another Power Card — but in that case it would be advisable to route the unused upper four bits to the lower four-bit positions of SK2 and then the second Power Card should be identical to the first; otherwise on the second card the four base resistors would need to go to bits 4 to 7, rather than bits 0 to 3.

If you do not want to use the upper four bits, you can omit SK2 and its interconnecting wires. One point you may notice — SK1 and SK2 are one way round in the photograph and the other way round on the drawings. The drawings are correct. Having assembled all the circuit board, there must be some way of holding it in the box. A piece of 3/8-in. balsa, 1-in. x 5-in. can be stuck, using sticky pads, to the board under the connector block. That gives support for when you are connecting wires to the Power Card. Also you could stick ¼-in. x 1-in. pieces of 3/8-in. balsa underneath SK1 and SK2 to give them some support, again using sticky pads.

If you are to use the Power Card to switch only low voltages you can leave it at that but for mains the box is needed, with the balsa feet stuck to the inside of the box.

Using more sticky pads, stick in the 7-way connector block. File five 3/16-in. slots ½-in. deep in the back panel and make sure they are smooth and then attach a solder tag with a 6BA nut and bolt. Then cut a slot in the left-hand side of the top of the box (by SK1) for the input to SK1 — see Figure 6.

Figure 5. *Model motor control: motor on/off using one relay*

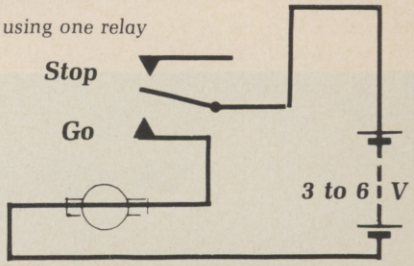


Figure 6. *Motor forward/reverse using one relay.*

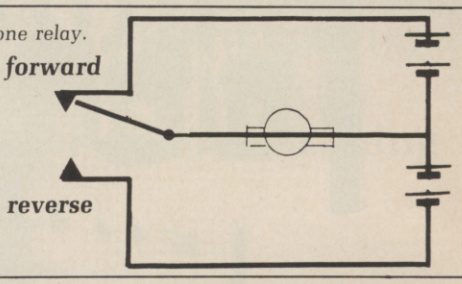


Figure 3. *Back of Perfboard*

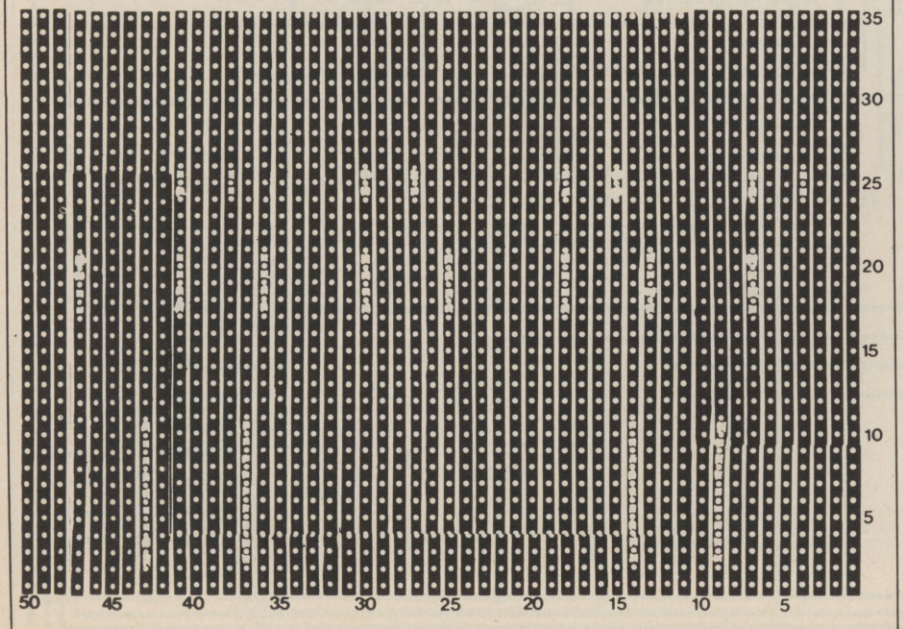
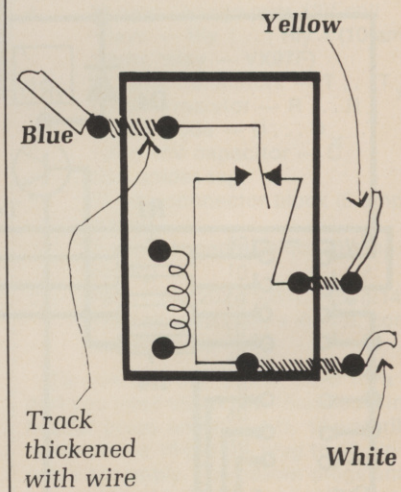


Figure 4. *Relay power connections.*



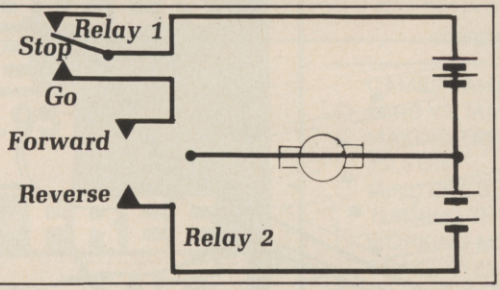


Figure 7. *Motor forward/reverse/stop using two relays.*

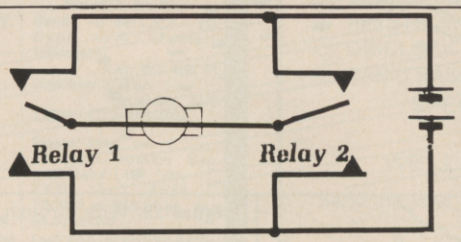


Figure 8. *Alternate method motor forward/reverse/stop using two relays.*

The box wiring is shown in Figure 7 and it should be done in thick wire which will carry 5 amps. Then the mains A.C. supply wires can be wired into the three connectors marked Mains A.C. In, Ground, Live and Neutral. The four loads can each be wired between one of the neutral out connectors and one of the four NO — normally open — connectors by relays.

To prevent putting any strain on the connectors by the wires leaving the box through the slots in the back panel, tie a knot in each lead before and after it goes through the slot — see Figure 13— making sure that there is slack on the inside of the box.

Nothing could be easier to operate. Attach the 16-pin DIL jumper cable between SK1 and the Latch Card or some other 8-bit output port, making sure that the orientation of the plugs is correct. If some other 8-bit output port is used, you must make sure that the various signals and power lines have been transposed to suit SK1.

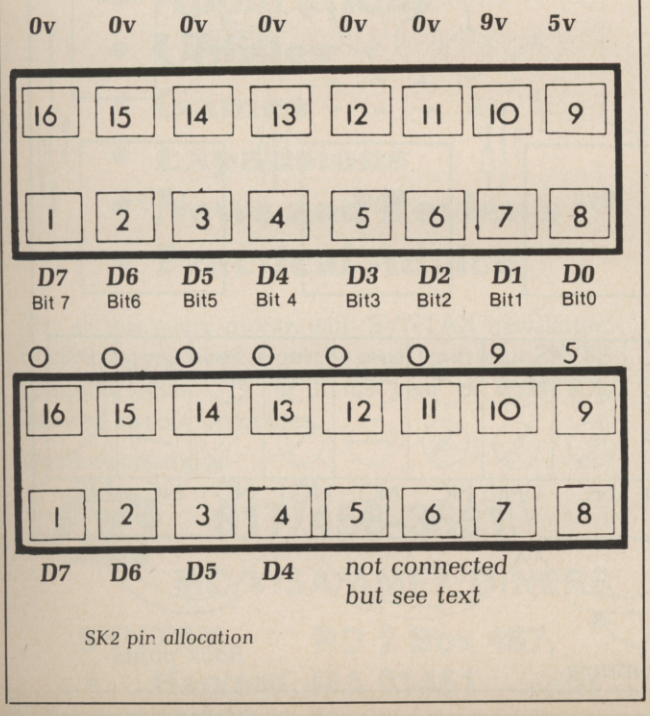
Writing zero to the port will turn off all the loads and writing a 1 to any of the low-order data bits will turn on that particular relay, e.g. POKE the port with 1 will turn on relay 1, POKE with 2 will turn on relay 2, POKE with 3 and both relay 1 and 2 will be turned on.

The Power Card will control small DC model motors easily but when that is being done the Power Card must not be connected to the mains. Figure 14 gives details.

Here is a sample program to drive Power Card using your computer and the Latch Card or interface.

```
10 REM ASSIGN PORT ADDRESS TO P
20 LET P = 36850
30 REM ASSIGN MAXIMUM PAUSE TIME TO T
40 LET T = 100
50 REM RANDOMLY SWITCH EACH RELAY
60 REM AT RANDOM TIMES
70 POKE P,RND*15
80 PAUSE1 + T*RND
90 GOTO 70
```

Figure 9. *SK1 pin allocation.*



SK2 pin allocation

Figure 10.

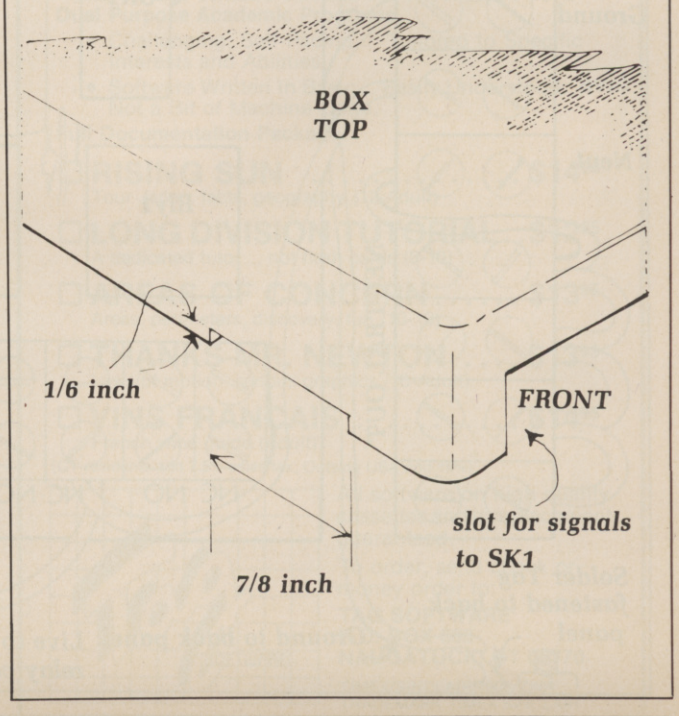


Figure 11. *Cutting holes in the Veroboard.*

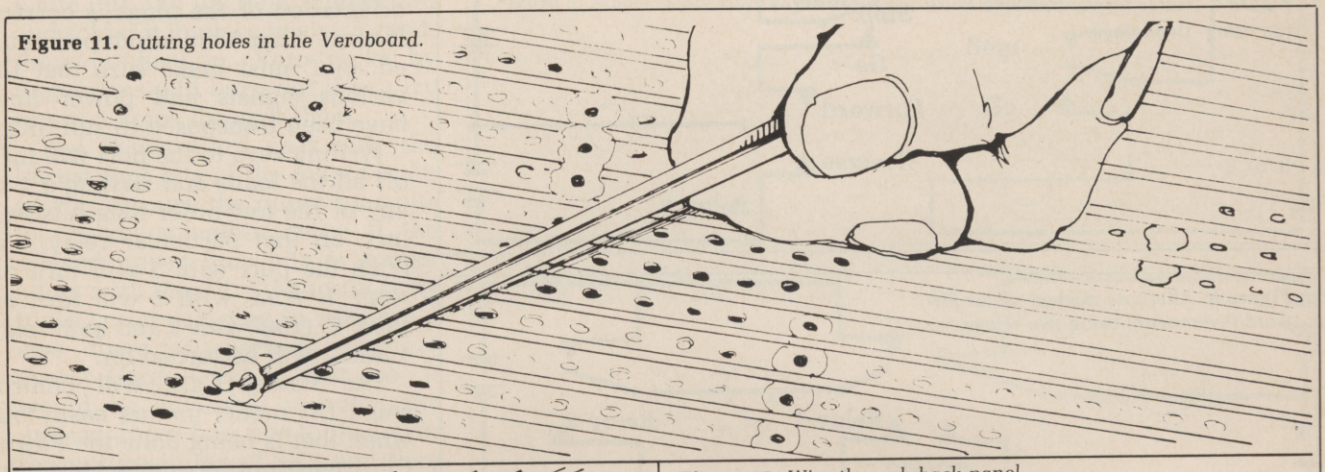


Figure 12. *Soldering relays onto boards.*

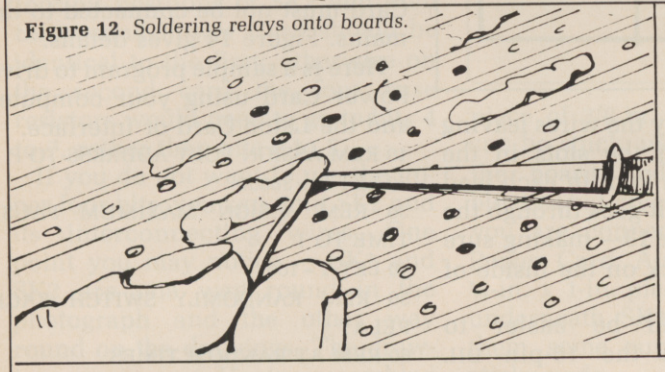


Figure 13. *Wire through back panel.*

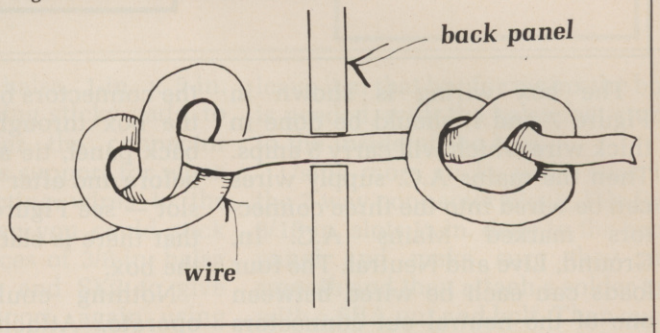
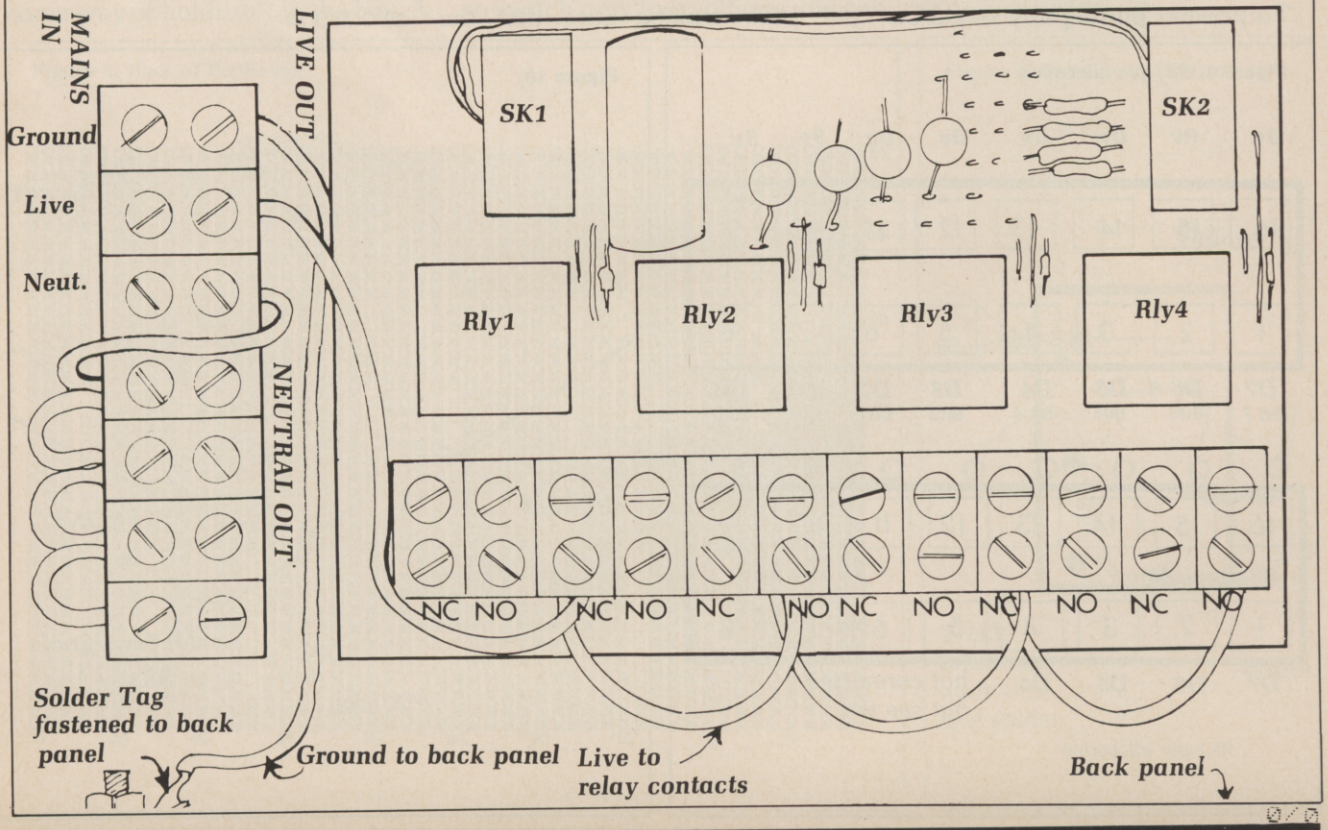


Figure 14. *Box wiring for low power mains load.*



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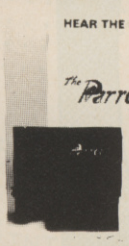

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SCREENER: An 'Instant' Screen Display Routine

Dr. Dan Tandberg outlines a technique useful for games and data display

SCREENER is a short utility program written in machine code and BASIC that will let you print an entire screen almost instantaneously. It allows you to compose and test screens in ordinary BASIC print statements (lines 100 to 121). Once you're satisfied with your display, running lines 200 to 370 will place it up in the first REM statement, preceded by a 40-byte machine code PRINT SCREEN subroutine. You can then delete all the remaining lines and use this line in any BASIC program in which you need to rapidly print this particular display. This routine can be used to great advantage, even by those who know nothing about machine code programming.

To enter SCREENER you should first type in the loader routine shown in Listing 2. (Don't forget the two semi-colons in line 50 — and be certain there are at least 40 characters after 1 REM). Proofread carefully and then run. You'll be prompted to enter the first byte of the machine code for the PRINT SCREEN routine shown in Listing 3. Type in the 40 numbers, left to right, e.g. 33 ENTER, 33 ENTER, 117 ENTER, etcetera. If all 40 bytes have been accurately put in then the CHECKSUM will equal 4220. If not, you'll have to run it and try again. Once you've successfully entered the code, you'll see that it's been moved into the first REM statement; delete lines 10 through 80 and save to tape.

This machine code subroutine has been written in such a way that it will rapidly and sequentially print any characters placed after it until it comes to E3h (STOP), and will begin a new line whenever it comes to 76h(=118). It can also be edited without "self-destructing". (See Listing 4).

Bring down line 1 and move the cursor all the way to the end of the line. Now type in 23 Xs followed by eight rows of periods as shown in Listing 1 to make space for your text. (You'll need to adjust the number of periods for longer screens; one line of periods will hold one full line of characters; shorter lines take correspondingly less.)

Finally, carefully type in and proofread BASIC lines 100 to 1000 shown in Listing 1 and save this tape as SCREENER.

To use this program simply carry out the following steps:

1. Load SCREENER.
2. Edit whatever text or graphics characters you want into lines 100 to 121, up to 32 characters per line. Line 100 goes to row 0; line 121 goes to row 21. (You'll need to put quotation marks after the PRINT and at the end of the string of characters.)
3. Press RUN, ENTER to see what your screen will look like; make any changes or corrections needed.
4. Adjust the number of periods in line 1 so there is *at least* one for each character and space in each non-empty PRINT line. (Extra periods won't hurt, but too few will result in a nasty crash!)

Listing 1. *SCREENER*

```
    1 REM 5578"■RND GOSUB ?£RND(S
TR$ ▒▒ RETURN STOP 4"SGN TAN ■4£S
GN FAST A■ FOR / FOR LPRINT STR$
■/ REM >■<> FAST XXXXXXXXXXXXXXXX
XXXXXXXXX.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
```

Listing 2. *LOADER*

```
    1 REM .....
.....345678901.....
   10 LET S=0
   20 FOR I=0 TO 39
   30 INPUT X
   40 POKE 16514+I,X
   50 PRINT TAB 4*I;X;
   60 LET S=S+X
   70 NEXT I
   80 PRINT '''"CHECKSUM= ";S
```

```
  100 PRINT
  101 PRINT
  102 PRINT
  103 PRINT
  104 PRINT
  105 PRINT
  106 PRINT
  107 PRINT
  108 PRINT
  109 PRINT
  110 PRINT
  111 PRINT
  112 PRINT
  113 PRINT
  114 PRINT
  115 PRINT
  116 PRINT
  117 PRINT
  118 PRINT
  119 PRINT
  120 PRINT
  121 PRINT
  122 STOP
  200 FAST
  210 LET P=16554
  220 LET D=P
  230 LET P=P+1
  240 IF NOT (PEEK P=118 AND PEEK
(P+5)=245) THEN GOTO 230
  250 LET P=P+5
  260 IF PEEK P<>245 THEN GOTO 370
  270 LET P=P+1
  280 IF PEEK P=118 THEN GOTO 340
  290 LET P=P+1
  300 IF PEEK P=11 THEN GOTO 270
  310 POKE D,PEEK P
  320 LET D=D+1
  330 GOTO 290
  340 POKE D,PEEK P
  350 LET D=D+1
  360 GOTO 250
  370 POKE D,227
  999 POKE 16419,100
 1000 LIST 100
```

Listing 3. *Code for* PRINT SCREEN

```
 33   33   117  36    1    170  64   237
 91   12   64   19    213  10   254  227
 35   5    209  201   168  32   12   209
 229  38   0    205   85   235  225  213
 3    24   234  18    3    19   24   229

CHECKSUM= 4220
```

Listing 4. *Disassembly of* PRINT SCREEN *Routine.*

```
ADDR HEXCODE  LABEL MNEMONIC
-----------------------------
4082 212175   BEGN LD HL,7521
4085 24            INC H
4086 01AA40        LD BC,40AA
4089 ED5B0C40      LD DE,(DFILE)
408D 13            INC DE
408E D5            PUSH DE
408F 0A       END? LD A,(BC)
4090 FEE3          CP E3
4092 2002          JR NZ,NEWL
4094 D1            POP DE
4095 C9            RET
4096 BC       NEWL CP H
4097 2000          JR NZ,PRNT
4099 D1            POP DE
409A E5            PUSH HL
409B 2600          LD H,00
409D EB            EX DE,HL
409E 19            ADD HL,DE
409F EB            EX DE,HL
40A0 E1            POP HL
40A1 D5            PUSH DE
40A2 03            INC BC
40A3 18EA          JR END?
40A5 12       PRNT LD (DE),A
40A6 03            INC BC
40A7 13            INC DE
40A8 18E5          JR END?
```

5. Use RUN 200 to compile your text.
6. You can now execute this machine code with RAND USR 16514 or LET L = USR 16514. If you do this in the SLOW mode you will appreciate how quickly this subroutine prints your display.
7. If you want to make further changes simply go back to Step 2.
8. Once you're satisfied with your screen, delete all lines after 1 and save to tape for use in future programs.

If you list line 1 you'll see that all the characters after the first newline byte (76h) are misinterpreted. This makes the listing look strange but doesn't interfere with execution. You will have trouble listing and working on subsequent lines after listing line 1, but RUN 999 will fix this. SCREENER generated subroutines work in either the FAST or SLOW mode.

This program can be used to produce a full screen, but you'll need to remember to add additional periods to the first line. The screens you create with SCREENER can be used in any BASIC program you write which needs an "instant" full screen display. I find these especially useful for games and in data display routines. I would appreciate hearing about any interesting applications you might develop. 0/0

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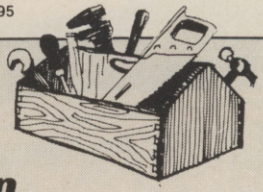

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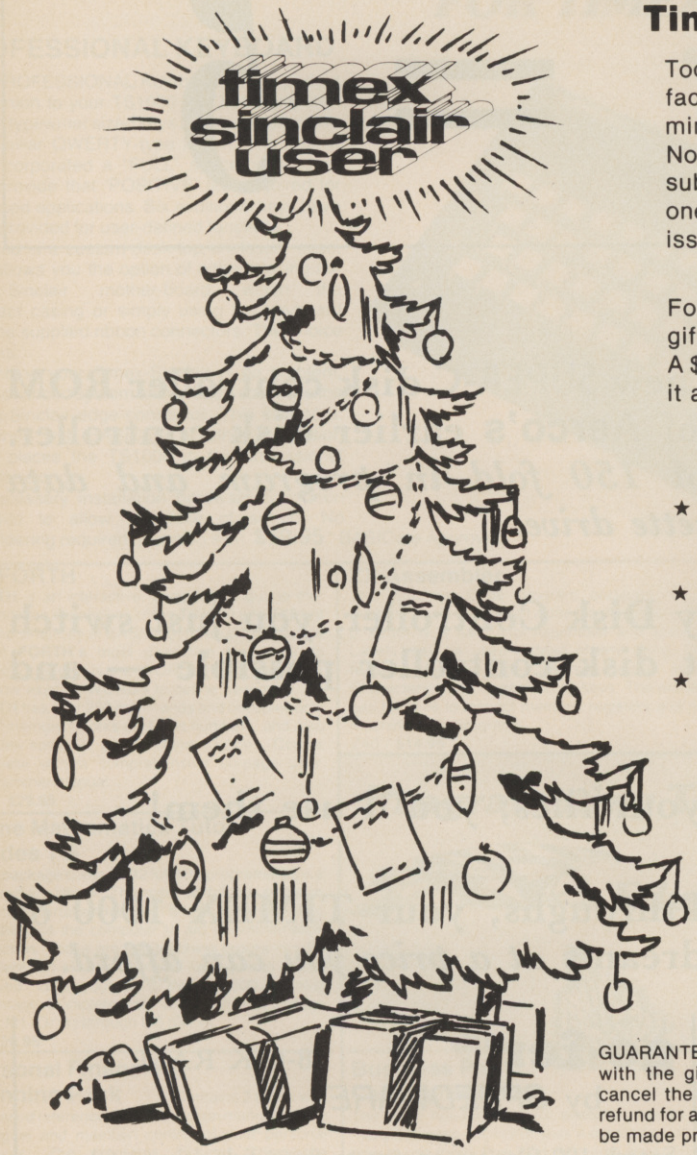

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PROGRAM PRINTOUT

PARADOX OF THE TWINS

THIS PROGRAM dramatizes the "Twin Paradox" phenomenon. In it one twin is sent on a journey into space lasting 16 years (eight years out and eight years back) at a speed you are prompted for. Applying the Einstein description of time and motion to the traveler, it is found that the other twin, who waits for him on Earth, ages faster than the traveler! For speeds of worldly experience (like the orbital speed of a Salyut or Space Shuttle) this age disparity is

```
   5 SLOW
  10 PRINT  "* * PARADOX OF THE
TWO TWINS * *"
  20 PRINT ,,"TWIN 1 STAYS ON EA
RTH. TWIN 2   TRAVELS FOR 8 YEAR
S AND RETURNS"
  30 PRINT ,,"HOW MUCH YOUNGER I
S TWIN 2 THAN TWIN 1?"
  40 PRINT ,,"INPUT SPEED OF TWI
N 2(SPEED OF LIGHT, 299,792 KM/H
, IS MAXIMUM)"
  50 INPUT V
  55 IF V>299791.9999 THEN GOTO
40
  60 CLS
  70 LET V=V/299792
  80 LET A=(1+V)/(1-V)
```

```
 90 PRINT "PCT OF LIGHT=";V*100
100 PRINT "YRS FOR 2","YRS FOR
1"
105 PRINT "OUTWARD TRIP"
110 FOR T=1 TO 8
120 LET TO=T*S0R A
130 PRINT T,TO
140 NEXT T
145 PRINT "INWARD TRIP"
150 FOR T=1 TO 8
160 LET TR=TO+T*S0R (1/A)
170 PRINT T+8,TR
180 NEXT T
182 LET Y=TR-T-7
184 IF Y>=1 THEN GOTO 204
186 IF (Y*365)>=1 THEN GOTO 205
188 IF (Y*3760)>=1 THEN GOTO 208
190 IF (Y*525600)>=1 THEN GOTO
210
192 GOTO 212
204 PRINT "YOUNGER BY ";Y;" YRS
"
205 GOTO 215
206 PRINT "YOUNGERBY ";Y*365;"
DAYS"
207 GOTO 215
208 PRINT "YOUNGER BY ";Y*8760;
" HRS"
209 GOTO 215
210 PRINT "YOUNGER BY ";Y*5256
00;" MINS"
211 GOTO 215
212 PRINT "YOUNGER BY ";Y*31536
000;" SECS"
215 PRINT "INKEY$ FOR NEXT RUN:
"
218 IF INKEY$="" THEN GOTO 218
220 CLS
230 RUN
300 CLEAR
310 SAVE "TWIN"
320 RUN
```

quite minor. At speeds nearing the speed of light, however, the age difference is not only substantial but actually fantastic. The traveling twin upon his return after 16 of his own years may find that his waiting twin died eons ago!

The program opens upon loading with a brief description. Twin 1 waits on Earth; Twin 2 goes on his trip. The speed of the trip is prompted for in kilometres per second and is tested that it not equal or exceed the speed of light.

Then this speed is displayed as a percent of the speed of light and the program proceeds to compare year-by-year the traveler's and the waiter's clocks. The traveler is the reference and his journey occupies 16 years on his own clock. At the end of the trip the amount by which the traveler is younger than the waiter is cited in customary time units.

An INKEY$ triggers for another go and an invalid input for the speed (such as a letter or keyword) terminates the program.

Submitted by John Pazmino of Brooklyn, New York.

HEXDUMP

```
                - HEXDUMP -
                                END 16508
START 16384
4000    FF C0 70 76 76 76 00 AA
4008    00 00 00 00 86 42 34 45
4010    64 45 88 45 9F 45 0E 42
4018    91 C0 98 45 9E 45 40 5D
4020    40 00 02 00 00 FF FF 0F
4028    1F 0F 42 32 00 00 7D FA
4030    4B 0C 00 00 03 D6 00 00
4038    BC 17 03 C0 00 00 00 00
4040    00 00 00 00 00 00 00 00
4048    00 00 00 00 00 00 00 00
4050    00 00 00 00 00 00 00 00
4058    00 00 00 00 76 81 00 00
4060    00 00 83 00 00 00 00 80
4068    80 80 80 80 80 80 80 80
4070    88 90 95 96 91 90 00 00
4078    00 00 00 00 00
```

```
1 REM     "HEXDUMP"  FOR ZX81
2 REM     BY BARRY MULLIGAN
3 REM
5 PRINT AT 19,10;"- HEXDUMP -
"
10 PRINT AT 21,1;"START ";
20 INPUT A
30 LET A=8*INT (A/8)
40 PRINT A;TAB 20;"END ";
50 INPUT Z
60 PRINT Z
70 SCROLL
80 FOR I=A TO Z
90 IF I<>8*INT (I/8) THEN GOTO
170
100 SCROLL
110 LET X=INT (I/256)
120 GOSUB 1000
130 LET Y$=X$
140 LET X=I-256*INT (I/256)
150 GOSUB 1000
160 PRINT Y$;X$;TAB 7;"";
170 LET X=PEEK (I)
180 GOSUB 1000
190 PRINT X$;" ";
200 NEXT I
210 STOP
1000 LET X$=CHR$ (28+INT (X/16))
+CHR$ (28+X-16*INT (X/16))
1010 RETURN
```

HEXDUMP displays the contents of any portion of your T/S1000,ZX81's memory in hexadecimal. It begins by asking for the start and end addresses in decimal. The start address is rounded to the preceding eight-byte boundary to begin the display. Each line will list the contents of eight bytes, along with the address of the first byte. The display will continue to scroll up from the bottom until the end address is reached. A good area to start with is the 'system variables' region (16384 to 16508) described in chapter 27 of the *T/S1000 User Manual*.

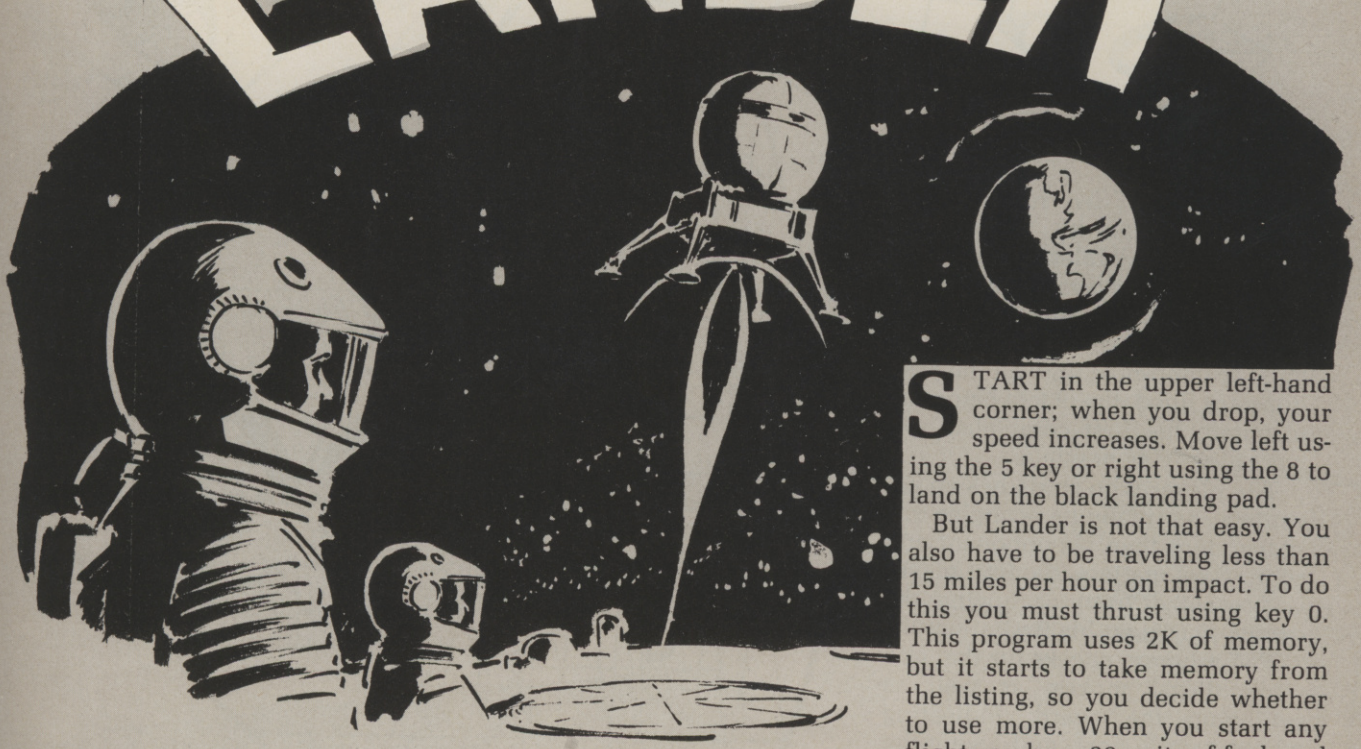
If you want to include a hex display in your own programs, the subroutine at line 1000 will convert any number in the range 0 to 255 to a two character string of corresponding hex digits. Two calls on the subroutine (as in lines 110 to 150) can convert a two-byte value, such as an address.

Submitted by F. Barry Mulligan of Atlanta, Georgia.

MINIBREAKOUT

```
  10 REM "MINIBREAKOUT"
  20 LET Z=NOT PI
  30 LET P=NOT Z
  40 LET T=P+P
  50 PRINT "▒▒▒
```

LANDER



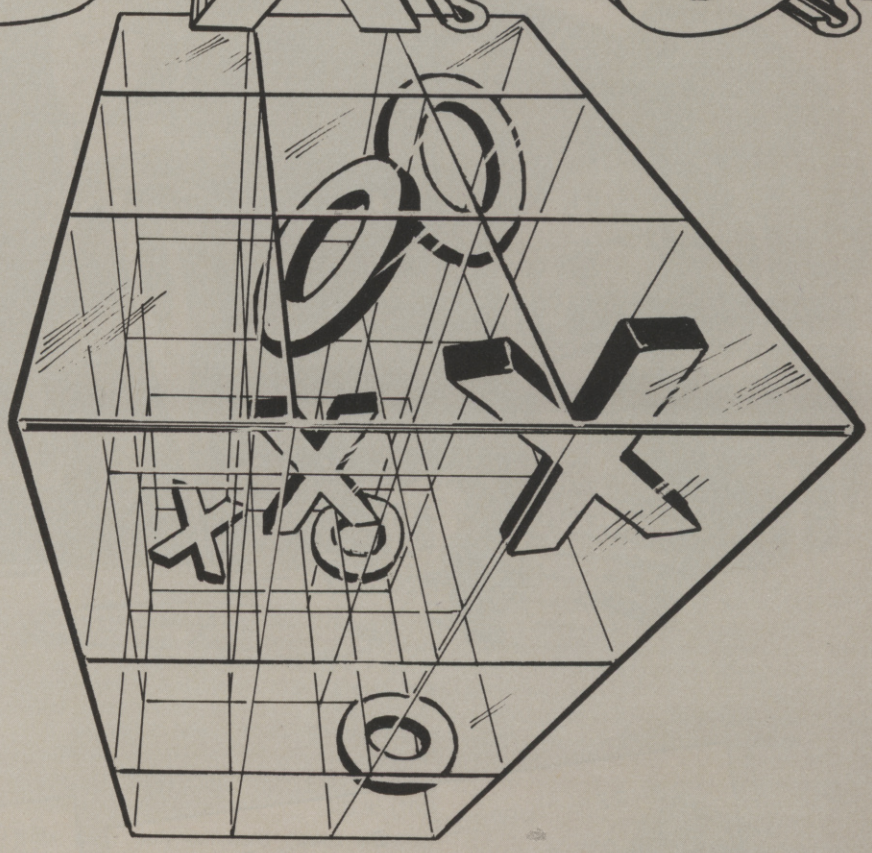
START in the upper left-hand corner; when you drop, your speed increases. Move left using the 5 key or right using the 8 to land on the black landing pad.

But Lander is not that easy. You also have to be traveling less than 15 miles per hour on impact. To do this you must thrust using key 0. This program uses 2K of memory, but it starts to take memory from the listing, so you decide whether to use more. When you start any flight you have 20 units of fuel, and you lose one unit each time you thrust.

Submitted by Tim Eckel of Perrysburg, Ohio.

```
  10 REM "LANDER" BY TIM ECKEL,A
GE 14
  20 LET S=0
  30 LET M=2
  40 PAUSE 60
  50 CLS
  60 PRINT AT 20,17;"SCORE ";S
  70 SLOW
  80 PRINT ," MEN LEFT"
  90 LET L=0
 100 PRINT AT 18,0;"/   //  /   ///
 ///  /  ////  /   //"
 110 PRINT "  //  //  //  //  ///
 ////////////"
 120 LET K=0
 130 LET A=3
 140 LET B=A
 150 PRINT AT A,B;"▄▄"
 160 IF INKEY$="0" THEN GOTO 250
 170 IF A=18 THEN GOTO 310
 180 LET L=L+.5
 190 PRINT AT A,B;"    "
 200 LET A=A+L
 210 IF A<0 THEN LET A=0
 220 IF INT (A)>=18 THEN LET A=1
8
 230 LET B=B+(INKEY$="8" AND B<2
9)-(INKEY$="5" AND B>0)
 240 GOTO 150
 250 PRINT TAB B;"VVV"
 260 LET L=L-(2.3 AND L>0)
 270 LET K=K+1
 280 IF K=20 THEN GOTO 510
 290 PRINT AT A+1,B;"    "
 300 GOTO 170
 310 IF B<>12 THEN GOTO 380
 320 IF L>1.5 THEN GOTO 380
 330 IF L*10<0 THEN LET L=.1
 340 PRINT AT 20,0;"YOU LANDED",
,"GOING ";INT (L*10);" MPH."
 350 LET S=S+1500+(K*100)
 360 IF L=.1 THEN LET S=S+1500
 370 GOTO 40
 380 LET Z=0
 390 PRINT AT A-1,B+1;"*"
 400 PRINT TAB B;"***"
 410 PRINT TAB B+1;"*"
 420 IF Z=1 THEN GOTO 450
 430 IF L*17<0 THEN LET L=L+2
 440 PRINT AT 20,0;"YOU CRASHED"
,,"GOING ";INT (L*17);" MPH."
 450 LET M=M-1
 460 IF M=-1 THEN GOTO 480
 470 GOTO 40
 480 PRINT AT 11,12;"GAME OVER"
 490 PAUSE 500
 500 RUN
 510 PRINT AT 20,0;"YOU RAN OUT"
,,"OF FUEL"
 520 PAUSE 60
 530 FOR A=A TO 18
 540 PRINT AT A,B;"                ";TAB B;"▄▄
▄▄"
 550 NEXT A
 560 LET Z=1
 570 GOTO 390
```

3-D X's AND O's



P.R. SCOTT has sent the kind of program Mr. Spock plays on long, winter evenings. **3D Tic Tac Toe** displays a cube and 27 possible positions for the Xs and Os. Unlike the 2D version, the game must be continued until all the positions are filled, the object being not to obtain the first completed row but as many as possible.

The player who starts has an advantage, as finally he occupies one space more than his opponent and so, to level matters, the first player is prevented from occupying the center square on his first attempt.

The program checks for that and other illegal moves, as well as setting-up the board, indicating whose turn is next, and giving the correct score throughout. Moves are entered by keying-in a letter, then a number, then ENTER. "A" indicates the front face of the cube, "B" the center and "C" the rear. Entering "R" will restart the game (T/S1000,ZX81, 16K).

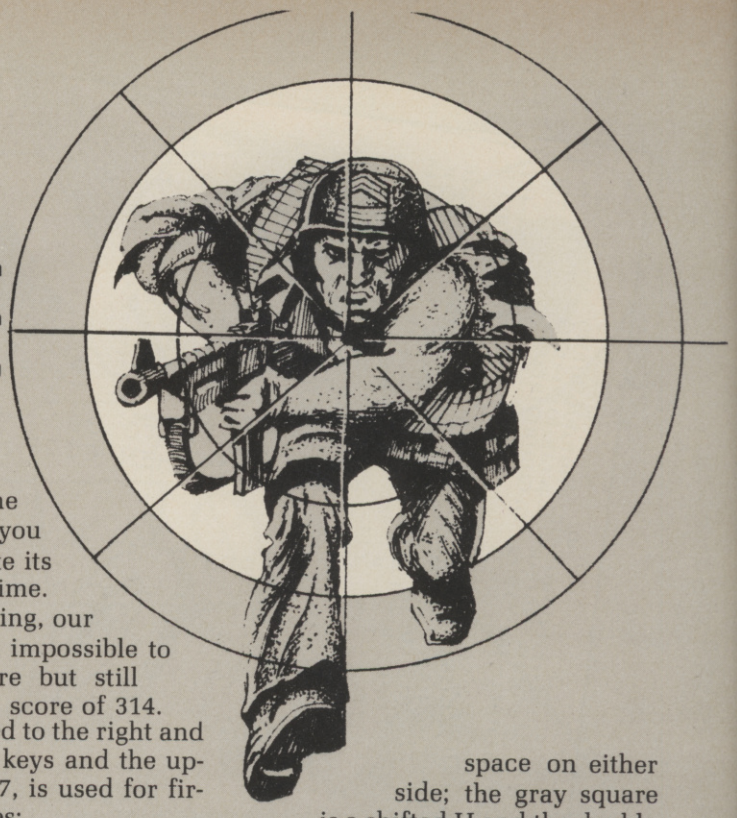
```
   5 DIM A(27)
  10 DIM C(18)
  15 DIM R(18)
  20 DIM X(27)
  25 DIM Y(27)
  30 LET X$="020814020814020814061218061218061218101622101622101822"
  35 LET Y$="060606121212181818040404101010161616020202080808141414"
  40 FOR Z=1 TO 27
  45 LET X(Z)=VAL X$(2*Z-1 TO 2*Z)
  50 LET Y(Z)=VAL Y$(2*Z-1 TO 2*Z)
  55 NEXT Z
  60 LET C$="020405050505060810111111112131313"
  65 LET R$="010301020304030109010809100903060912"
  70 FOR Z=1 TO 18
  75 LET C(Z)=VAL C$(2*Z-1 TO 2*Z)
  80 LET R(Z)=VAL R$(2*Z-1 TO 2*Z)
  90 NEXT Z
 100 FOR Z=1 TO 27
 105 LET A(Z)=0
 110 NEXT Z
 115 LET S=1
 120 LET N=1
 170 CLS
 175 GOSUB 1000
```

```
180 IF S=1 THEN PRINT AT 2,0;""
"X"" TO GO"
185 IF S=-1 THEN PRINT AT 2,0;"
""O"" TO GO"
190 PRINT AT 20,14;"
"
200 INPUT Z$
205 IF N=28 THEN GOTO 100
210 IF Z$(1)="R" THEN GOTO 100
215 IF Z$(1)="A" THEN LET Z=0
220 IF Z$(1)="B" THEN LET Z=9
225 IF Z$(1)="C" THEN LET Z=18
235 LET Z=Z+VAL Z$(2)
240 IF A(Z)<>0 THEN GOTO 390
245 IF N=1 AND Z=14 THEN GOTO 3
90
250 LET A(Z)=S
255 LET N=N+1
260 IF S=1 THEN PRINT AT Y(Z),X
(Z);"▩"
265 IF S=-1 THEN PRINT AT Y(Z),
X(Z);"▣"
270 GOSUB 500
275 LET S=-S
280 GOTO 180
390 PRINT AT 20,14;"ILLEGAL, TR
Y AGAIN"
395 GOTO 200
500 FAST
505 LET SX=0
510 LET SO=0
515 FOR Z=1 TO 13
520 LET W=A(14-Z)+A(14)+A(14+Z)
525 IF ABS W=3 THEN GOSUB 800
530 NEXT Z
535 FOR Z=1 TO 18
```

```
540 LET W=A(C(Z)-R(Z))+A(C(Z))+
A(C(Z)+R(Z))
545 IF ABS W=3 THEN GOSUB 800
550 LET V=28-C(Z)
555 LET W=A(V-R(Z))+A(V)+A(V+R(
Z))
560 IF ABS W=3 THEN GOSUB 800
565 NEXT Z
570 PRINT AT 20,0;"▩=";SX;",▣=
";SO
575 SLOW
580 RETURN
800 IF W=3 THEN LET SX=SX+1
803 IF W=-3 THEN LET SO=SO+1
810 RETURN
1000 PRINT AT 0,6;"3D NOUGHTS AN
D CROSSES"
1004 PRINT AT 2,10;"1▬▬▬▬▬2▬▬▬▬
3"
1006 PRINT AT 3,7;"▟▟/
▛▛▛"
1008 PRINT AT 4,6;"1    / 2     3
▛▛▛"
1010 PRINT AT 5,3;"▟▟▛      /     ▬
▛▛▛"
1012 PRINT AT 6,2;"1▬▬▬▬▬2▬▬▬▬▬3
▛▛▛"
1014 PRINT AT 7,2;"▌        /     ▌
▛▛▛"
1016 PRINT AT 8,2;"▌        4     ▌
 5     6"
1018 PRINT AT 9,2;"▌        /     ▌
▛▛▛"
1020 PRINT AT 10,2;"▌    4    / 5
▌    6    ▌"
1022 PRINT AT 11,2;"▌        /
▌        ▌"
1024 PRINT AT 12,2;"4      5 /
6        ▌"
1026 PRINT AT 13,2;"▌        /
▌        ▌"
1028 PRINT AT 14,2;"▌        7///
▌/8/////9"
1030 PRINT AT 15,2;"▌    ///
▌    ▟▟▛"
1032 PRINT AT 16,2;"▌    7     8
▌    9"
1034 PRINT AT 17,2;"▌///
▙▟▛"
1036 PRINT AT 18,2;"7▬▬▬▬▬8▬▬▬▬
▬9"
1090 RETURN
```

3-D X's AND O's

SHOOTING RANGE



A VERY frustrating game has been sent by Christopher Wysocki. It is called **Shooting Range** and involves firing at a range of constantly-changing letters.

The letters have values ranging from one for A to 26 for Z and the aim is to achieve as high a score as possible. A time-limit is imposed by a gray square which travels along the row of letters and the game ends if it is not shot down before reaching the end of the rows.

It is a simple program and because of that the movement of the bullets from the gun is slow and only one shot can be fired at a time. That makes it difficult to hit the gray square, as you have to anticipate its position in good time.

Throughout testing, our reviewer found it impossible to hit the gray square but still managed a high score of 314.

The gun is moved to the right and left by the cursor keys and the upward cursor, key 7, is used for firing. Graphics notes:

Line 70, a shifted Q with a space on either side and shifted 3 with a space on either side; the gray square is a shifted H and the double quotes throughout have a space between them except for line 580.

```
  1 REM "GUNNER"
  2 GOTO 500
  5 LET HS=0
  8 LET H=19
 10 DIM A$(1,6000)
 15 LET X=0
 20 FOR N=1 TO 65 STEP 2
 30 LET A$(1,N)=CHR$ (INT (RND*
26)+166)
 40 NEXT N
 45 LET N=2
 50 LET Z=0
 55 LET S=0
 60 PRINT AT 0,0;"SCORE","HIGH-
SCORE";AT 1,0;S,HS
 70 PRINT AT 3,0;A$(1,N TO N+31
);AT 5,0;A$(1,N+33 TO N+65);AT 2
1,Z;" ▟ ";AT 20,Z;" . "
 80 LET A$(1,N+65)=CHR$ (INT (R
ND*26)+166)
 90 IF INT (RND*40)=10 THEN LET
 A$(1,N+65)="▒"
 95 IF A$(1,N+1)="▒" THEN GOTO
350
100 LET N=N+2
105 IF X<>0 THEN GOTO 140
110 IF INKEY$="8" AND Z<28 THEN
 LET Z=Z+1
120 IF INKEY$="5" AND Z>1 THEN
LET Z=Z-1
130 IF INKEY$="7" THEN GOTO 140
135 GOTO 70
140 LET H=H-2
150 PRINT AT H,Z+1;
155 LET R=PEEK (PEEK 16398+256*
PEEK 16399)
156 PRINT ","
160 PRINT AT H+2,Z+1;" "
170 LET X=1
180 IF R<>0 THEN GOTO 250
190 IF H<3 THEN PRINT AT H,Z+1;
" "
200 IF H<3 THEN LET X=0
210 GOTO 70
250 IF R-165<0 THEN LET R=165
255 LET S=S+(R-165)
260 LET X=0
270 PRINT AT 1,0;S
280 IF H=3 THEN LET A$(1,N+(Z-1
))=" "
290 IF H=5 THEN LET A$(1,N+(32+
Z))=" "
300 LET H=19
310 GOTO 70
350 CLS
360 PRINT "SCORE","HIGH-SCORE"
370 IF S>HS THEN LET HS=S
380 PRINT S,HS
390 PRINT
400 PRINT "THE""▒"" GOT AWAY."
410 PRINT
420 PRINT "DO YOU WANT TO TRY A
GAIN(Y/N)?"
430 INPUT Z$
440 IF Z$<>"YES" AND Z$<>"Y" AN
D Z$<>"NO" AND Z$<>"N" THEN GOTO
 430
450 CLS
460 IF Z$="YES" OR Z$="Y" THEN
GOTO 8
470 STOP
500 PRINT TAB 12;"GUNNER"
510 PRINT TAB 12;"------"
520 PRINT
530 PRINT "THE POINT OF THIS GA
ME IS TO GET AS MANY POINTS AS P
OSSIBLE BY    SHOOTING THE LETTER
S BUT YOU    MUST NOT LET THE""▒
""GET AWAY."
540 PRINT "THE FURTHER THE LETT
ER IS IN THE ALPHABET THE MORE I
TS WORTH FOR EXAMPLE""▒""IS WORT
H MORE THAN""▒"".TO MOVE THE GUN
 YOU USE THE"
550 PRINT "CURSOR KEYS AND THE
UPWARD      POINTING CURSOR KEY
TO FIRE.",,,"GOOD LUCK"
560 PRINT
570 PRINT "HIT ANY KEY TO CONTI
NUE."
580 IF INKEY$="" THEN GOTO 580
590 CLS
600 GOTO 5
```

BEYOND 64K...

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Making A Good Thing Even Better

The T/S1000's membrane keyboard has been called its worst feature, but it is part of the reason the T/S is so inexpensive. A few months ago *Timex Sinclair User* took a good hard look at add-on keyboards in the feature "6 Keyboards Compared." Now we take a closer look at the assembly and operation of the dk'tronics keyboard. By Gillam

PHOTOGRAPHY • Gillam

Few Problems, Many Advantages The dk-tronics replacement keyboard, despite a few problems, offers the advantages you'd expect from a full-stroke typewriter style keyboard, plus a separate numeric pad for convenient number-crunching.

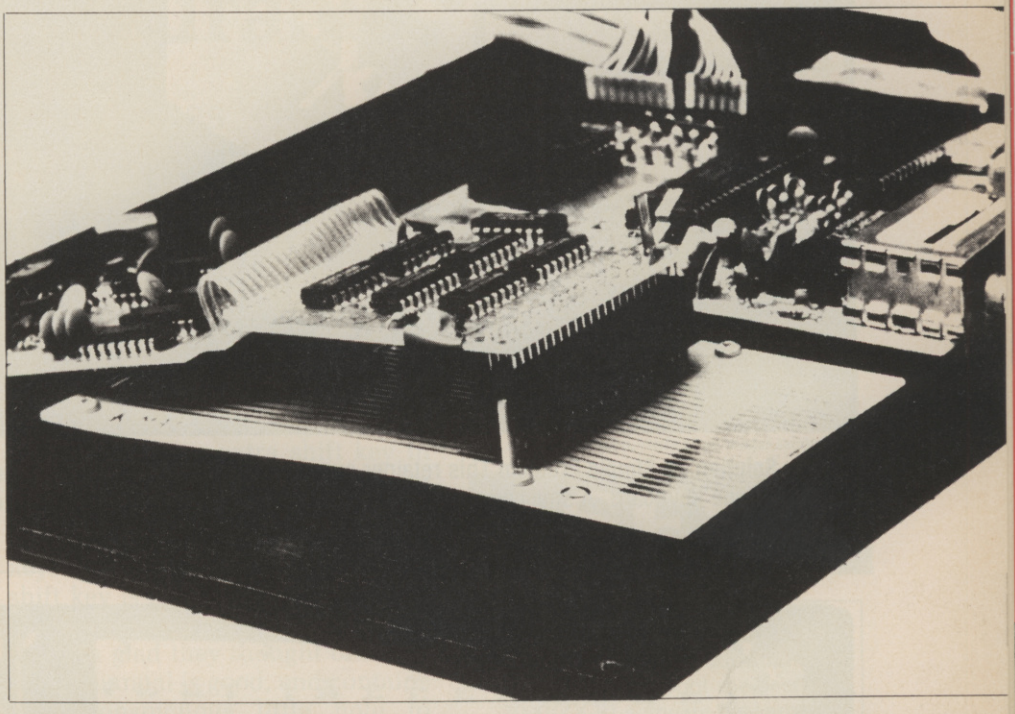
WHAT COULD BE BETTER than a full-stroke replacement keyboard for your Timex Sinclair computer? How about one with a separate numeric pad, plus room inside the case for RAM expansion, power supply and switch, and maybe a few other goodies as well? If that appeals to you, check out the dk'tronics ZX keyboard: it does much to overcome problems inherent in the ZX81 and T/S1000 original membrane keypad. Though it has some problems of its own, they are not insurmountable, and, depending on your facility with hand tools, your patience and your intended usage of the computer, this accessory keyboard may well be an improvement worth your money.

To start with the obvious, I must say that I'm very pleased with the feel and response of the dk'tronics keys. They are similar to the keys on my IBM Selectric typewriter, though they lack the IBM's "snap," which is due to the mechanical movements within the typewriter. And the 12-key numeric pad is a valuable boon for users who have business programs for their computers and who like to program in machine code as I do. The full-size keyboard allows the user to hold his fingers in touch-typing or calculator positions; that plus the full-stroke movement of the keys allows faster programming — not because the computer accepts input any more quickly, of course, but rather because the user is more confident and faster at *supplying* the input. The numeric pad is actually a repeat of the 10 number keys (with the corresponding cursor controls, other shift functions and graphics characters) plus an additional shift key (handy for right-hand use when shifting a left-hand character) and another period/comma key (for decimals, naturally, and dandy for POKEs too). One thing the ads do not mention is that the keys as supplied are unmarked. The legends are printed on a sheet of die-cut, pressure-sensitive clear plastic film which the purchaser must apply to the keys himself. The printing is on the sticky side of the sheet, so it is not likely to rub off with use.

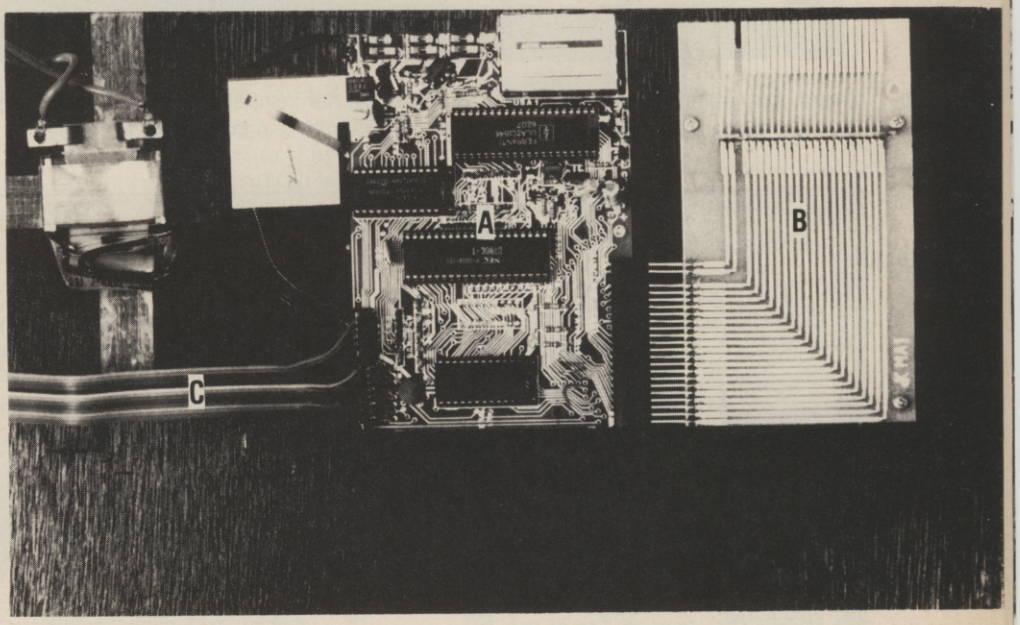
The case provided is considerably larger than the original (15-in. x 9.5-in. x 2.5-in.) which is an advantage in my opinion: it makes it easier to balance the computer on my lap for lazy use. The top and sides are molded from some sort of low-density plastic that appears to be quite sturdy — it survived the United States Mail from New York to Alaska, protected only by a flush-fitting corrugated cardboard box. The bottom of the case is plywood; inside is a motherboard, which connects to the computer's printed circuit board at one end, a RAM expansion at the middle — joy and jubilation! no more wobbly RAM-pack! — and any other edge-connecting peripherals at the other end, through an opening at the back of the case. The keys are mounted on a printed circuit board of their own, which is attached to the upper part of the case. Their signal is sent to the computer via a dual ribbon connector that snaps simply into place.

The computer printed circuit board attaches to the baseboard using three screws from the T/S,ZX case. Blocks are provided for mounting the board, but I didn't find the hole markings mentioned in the ads. The screws are not woodscrews, so I had to drill pilot holes before mounting the board. The mounting screws should not be any more than barely snug — because of components located on the underside of the board, they are not meant to be tightened down flush to the baseboard. The channel selector switch becomes a support leg, and must be set to the desired position before closing the case; afterwards, it is virtually inaccessible. The computer board's position is determined by the position of the motherboard, which it plugs into. In the case I received, the holes in the back did not align with their intended plugs, and I had to modify them to get the television and power jacks to fit the sockets. This was simple to do as the material of the case can be easily cut and filed.

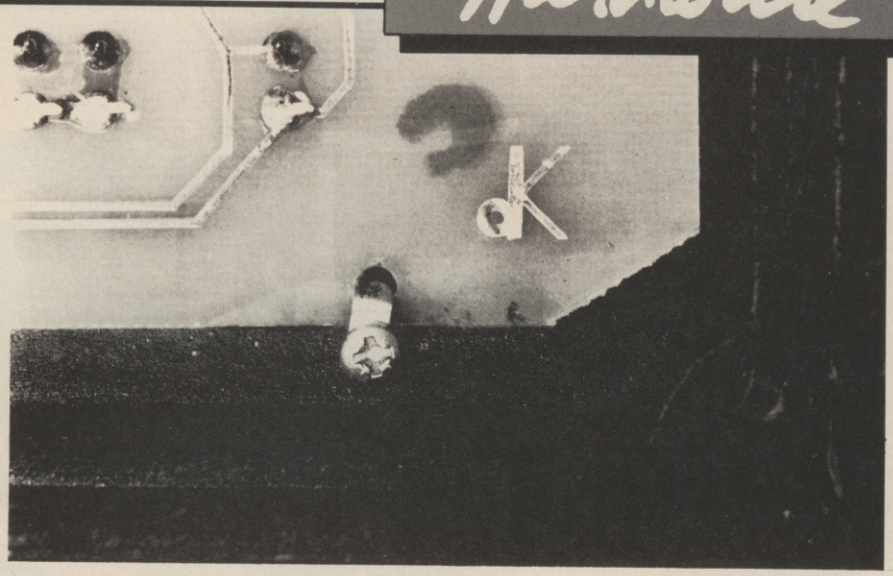
Further modification of my case



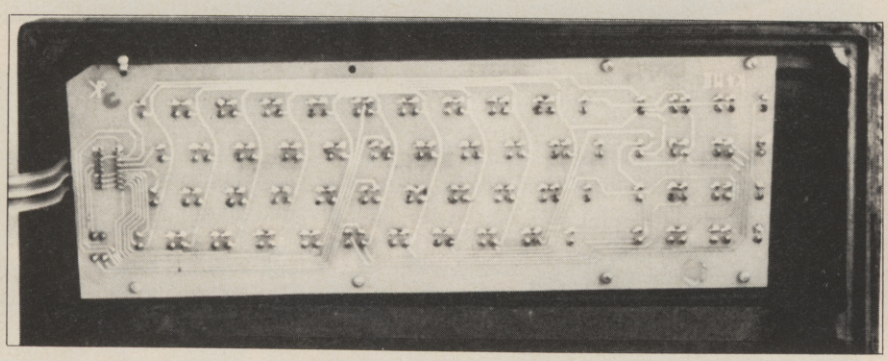
Keyboard Eliminates RAMpack Wobble The Timex Sinclair 1016 16K RAM expansion unit (or any third-party RAMpack) can be uncased and plugged onto the motherboard inside the case, eliminating wobble and resultant program loss.



Internal Layout The computer's printed circuit board (A) mounts inside the bottom of the case and plugs into the motherboard (B), which is factory installed. The ribbon connector (C) supplies the signal from the keyboard. The power converter can also be installed in the case but should be attempted only by those with a good understanding of the dangers of electricity and the need for insulation.



Simple Solution To Simple Problem This retainer cured the problem of sagging caused by the oblique keyboard. A small washer will work as well, so long as it doesn't touch the circuit.



Board Cut Imperfectly This board, which holds the keys and their circuitry inside the top of the case, was cut at an angle, resulting in a poor fit with the case.

What We Said

In TSU 1:3 our reviewer M.K. Wilson rated six keyboards, including the dk'tronics. "In all," she concluded, "the dk'tronics keyboard is responsive and fast, though its lack of a space bar is a slight inconvenience." The chart below shows how the dk'tronics keyboard rated with the others.

Keyboard	Assembly required?	Does keyboard sit apart from computer?	Numeric pad?	Space bar?	Overall rating	Suggested retail price
dk Tronics	yes	No	Yes	No	★★★	$81[1]
E-Z Key 60	Yes	No	Yes	Yes	★★★★	$85
Gladstone Professional	Yes	No	No	Yes	★★★½	$80
Kayde	Yes	Yes	No	No	★	$75[1]
Kempston Klik	Yes	No	No	No	★★	$50[1]
Memotech	No	Yes	No	No	★★	$100

[1] – *Units sold by mail from U.K. Price does not include shipping charges.*

was necessary to make the keyboard fully functional. The printed circuit board on which the keys are mounted was cut obliquely, resulting in a poor fit with the case. As first supplied, the shift key locked in place every time I pressed it. I found that this was due to the board being mounted crookedly, forcing the shift key hard against the edge of the cutout. After reopening the case and dismounting the board, I was able to quickly file the opening larger to accommodate the shift key without interference. However, the nonrectangularity of the board aggravated another problem: two of the eight mounting screws meant to hold the board to the case were absent due to their holes lining up with empty space instead of with the case as the designer had apparently intended. Thus, whenever I used the shift, A, S or Z keys, the keyboard would sag. The keys functioned properly, but it slowed me down a little, and I feared that continued bending might eventually cause damage to the board. I solved the problem by adding a retainer to a screw in the corner hole (a washer would work as well), which overlaps the board and holds it firmly.

Altogether, the assembly as described in the instructions and my adaptations took me less than two hours, and that includes solving the problems outlined above, and applying the 52 small patches of plastic to identify the keys.

In many ways, the dk'tronics keyboard is an improvement on the original, but it could be vastly improved by more careful manufacture. It's one of only a few keyboards for the Timex Sinclair computers that offers a separate numeric keypad, and that — plus the real typewriter keys — make it worth the price. Its value could be further enhanced by increasing the number of keys available on the numeric pad — the arithmetic functions (+,–,*,/ and=) for example, or the A through F keys for machine code hackers. Dk'tronics, are you listening?

Hardware

Strong and Durable

Dave Hakes evaluates the Memotech keyboard

THE MEMOTECH KEYboard is one of the best looking and best working keyboards I have ever seen. The quality is excellent (which seems usual for Memotech). The encasing is aluminum, for durability and strength.

As with all Memotech products, the keyboard requires no opening of the computer and no voiding of the warranty. The interface module simply plugs into the expansion bus; other peripherals can be installed in its plug in the rear. The keyboard connects to the interface with a 12-in. ribbon cable: if you plan to use the keyboard next to the computer, the length will be no problem, but it isn't quite long enough to allow you to move the computer completely out of the way to give yourself more room.

The keys require almost no pressure from your fingers to engage the switch. They are spaced a little too close together, and wobble a bit, which is somewhat annoying. Excluding SHIFT combinations, nothing happens when you press more than one key at a time. This means that you can't press ENTER until you've removed your fingers from the keys. This is not a major problem, though.

I was surprised to find that Memotech did not create a separate space bar: after all, what is a typewriter or computer without a space bar? They made up for their mistake with an extra shift key in the upper right hand corner, where it greatly simplifies using the delete, graphics and cursor control keys. Considering how much the shift key is used on Timex Sinclair computers, this is a wonderful idea, and I'm glad they thought of it.

The manual is good, and contains an inconspicuous little note to game players that explains that the original T/S keyboard still functions when the new keyboard is operating. This can be used quite nicely in two-player games where both players are needed at the console at the same time.

Despite the few problems, the Memotech keyboard is still highly recommended to anyone who frowns on membrane keyboards. On a scale from 1 to 10 (10 being the highest), I would give the Memotech keyboard a rating of 8.

Requires No Assembly The attractive aqua-blue Memotech keyboard has no space bar, perhaps its biggest flaw, but is still enough of an improvement over the T/S membrane keyboard that we give it a rating of 8 on a scale from 1 to 10. The T/S keyboard remains operative after the Memotech is connected, an ideal set-up for games requiring two players.

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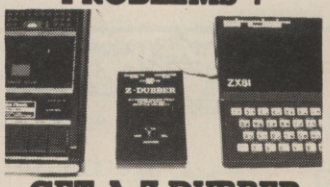

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The case can be purchased separately with the keyboard aperture uncut, so if you have one of our early uncased keyboards, or in fact any other suppliers' keyboards, these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute job and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX 81 or Spectrum case.

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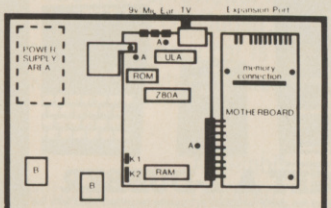
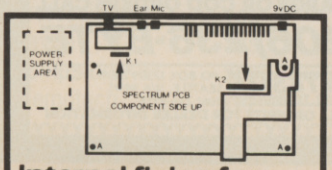


Internal fixing for ZX 81 keyboard case.



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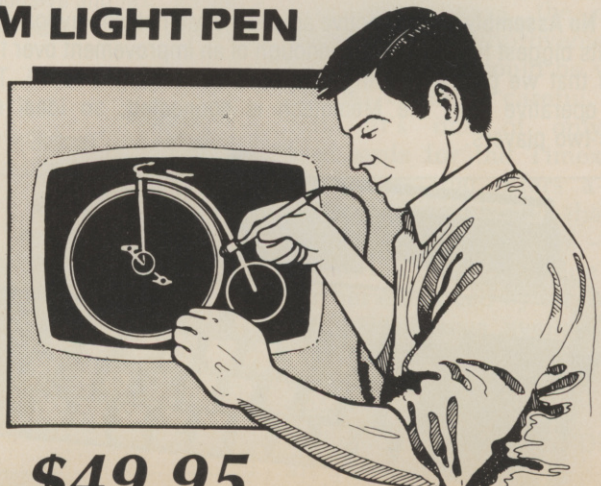

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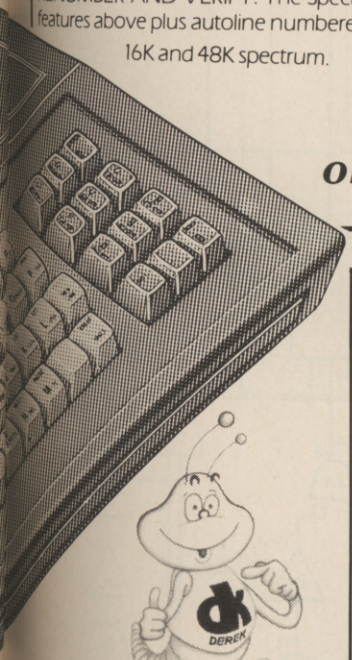
ZX 80-81 Spectrum HARDWARE

SPECTRUM/81 TOOLKIT

This is the toolkit which won acclaim in the feature in the August 1982 issue (pages 29 and 30) of Sinclair User. "It is the most impressive program, fast in execution with clear and full instructions...it stands out from the rest of the field." The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K spectrum.



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RAMKIT:

Build your own 64K RAM

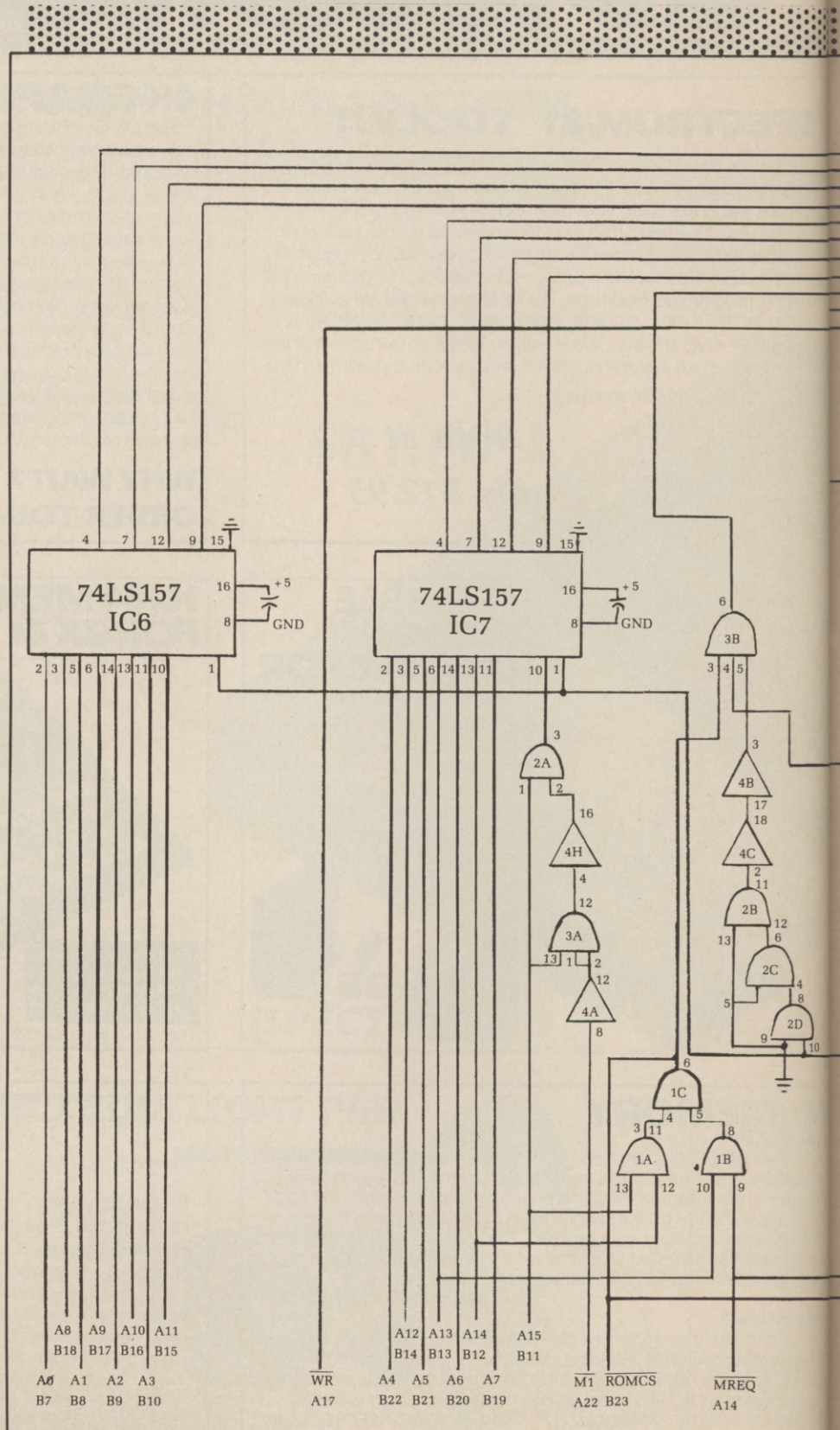
All it takes is two and a half hours, writes Ross Williams

NEED MORE MEMORY? Shortly after the ZX81 was released, many questions arose that Sinclair's poor technical documentation left unanswered. Memory! Could one add more than Uncle Clive's intended 16K of RAM? Quite a few knowledgeable people had said "No, the Sinclair bussing and memory map are too awkwardly structured." Since those times, industry has produced add-on RAM expansions for T/S computers approaching 1 megabyte.

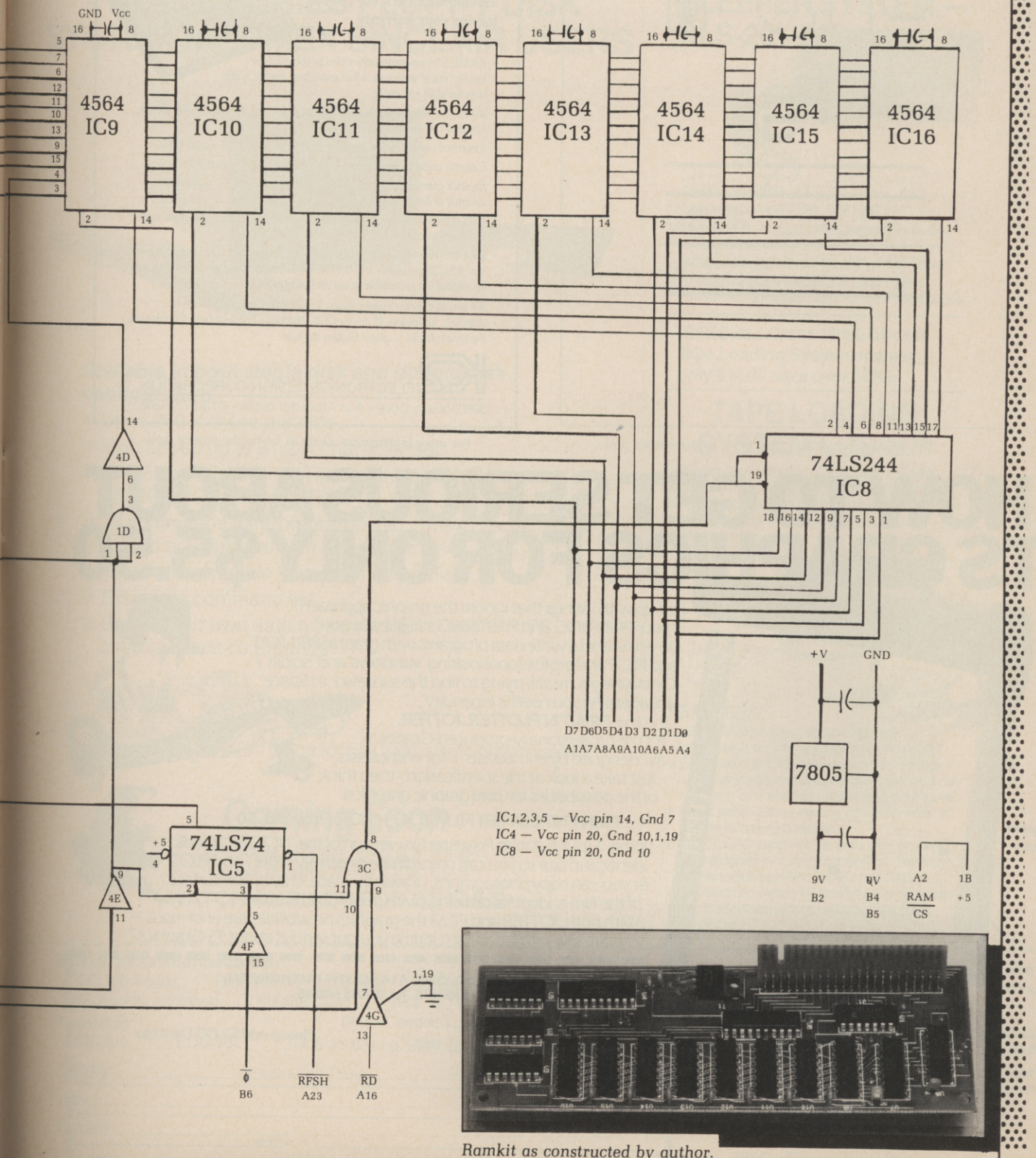
Ramkit is a 64K RAM expansion project, designed to be easy to build and simple to use. Although the components are available in most electronic shops, there may be quite a bit of travelling and price comparing to do; we suggest you order the complete package of components including the printed circuit board from Gladstone Electronics (see box at end of article). Construction is relatively straightforward with a total assembly time of about two and one-half hours.

Memory Restrictions

Users should be aware of some of the memory restrictions that T/S,ZX computers place upon the Z80 microprocessor's memory mapping structure. The Sinclair ROM and circuit logic have been set out in a manner that makes BASIC

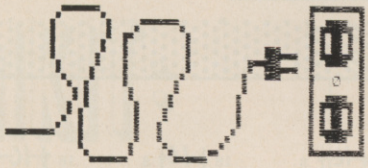


Circuit diagram



IC1,2,3,5 — Vcc pin 14, Gnd 7
IC4 — Vcc pin 20, Gnd 10,1,19
IC8 — Vcc pin 20, Gnd 10

Ramkit as constructed by author.



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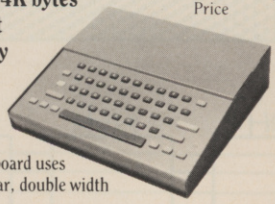

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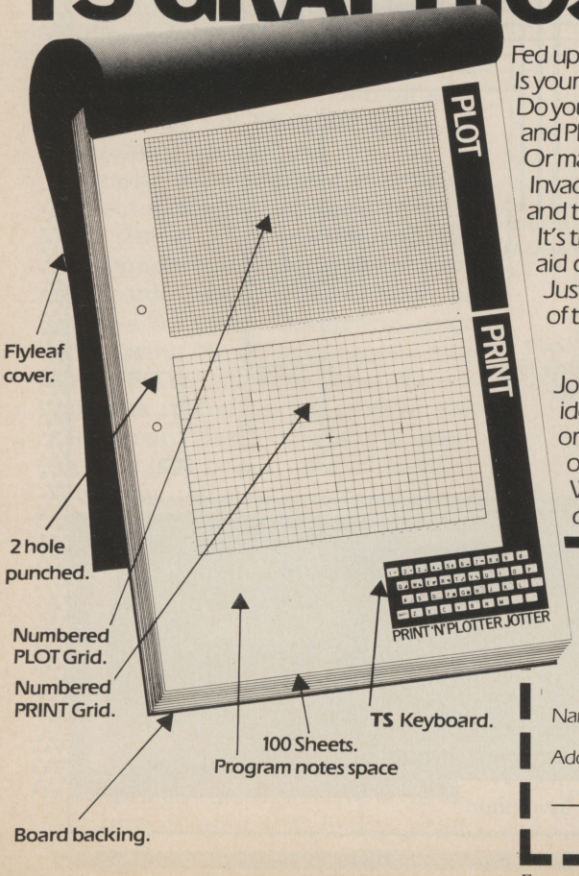

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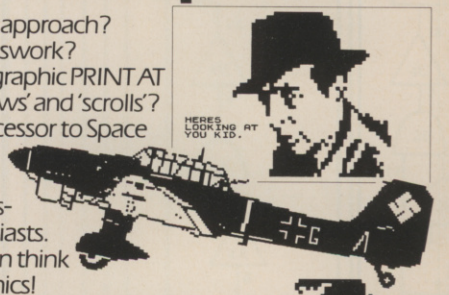

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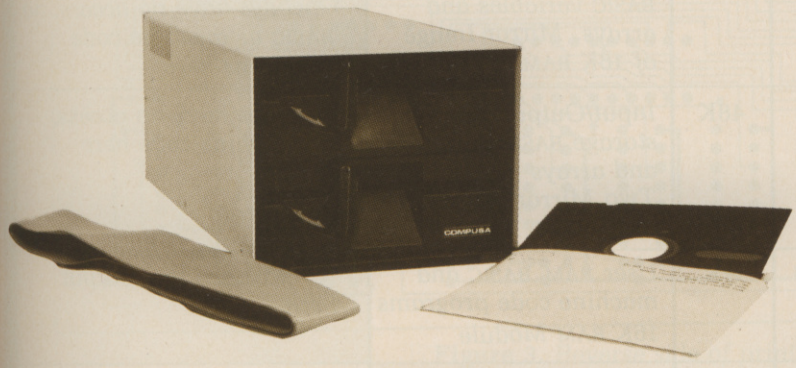

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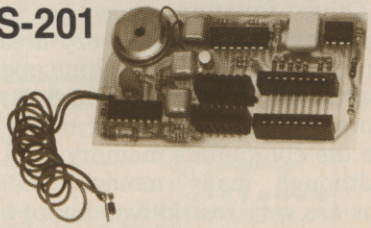

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Figure 1. *Memory Map*

Decimal Address	Functional Address	Sinclair Map	Ramkit
65536	64K	*Screen Display Area BASIC variables and arrays. Mirror Image of 16K RAM*	*D File must be relocated Opcodes have no access, no BASIC or machine code programs here*
49152	48K	*Input/Output data storage BASIC variables and arrays Two Mirror Images of 8K RAM*	*Opcodes have no access, no machine code here*
32768	32K	*User RAM, BASIC and machine code programs 16K RAM Module*	*No ROM or input/output here*
16384	16K	*RAM with operating system support ROM and COS. Mirror Image of ZX-81 ROM*	*ROM usage by supporting peripherals may overlap addressing RAM for user M/C and Data*
8192	8K	*Sinclair BASIC ROM*	*Paging ROMs would entail writing O/S software as well*

Note: *When Ramkit is connected, the internal 1K RAM is disabled by internally shutting the RAM CS line. Programming in the 8 to 16K region is by machine code only. This area will be safe from the NEW command. Any data stored here must be transferred to another location if this information is intended to be saved. RAM available for BASIC programs and operating system data in shaded area only.*

programming in certain RAM areas impossible. See the chart in Figure 1. Other functions may be implemented in these memory areas through either fancy machine code programming or unique hardware changes that may mask or restructure the computer's memory map.

Although many memory locations are very restrictive, do not be too discouraged about this. Some of these areas are still quite useful. For instance, in the BASIC ROM addressing area, locations 7680 to 8191 are used by Sinclair for character generation. One could easily write one's own character set, bypassing Sinclair's.

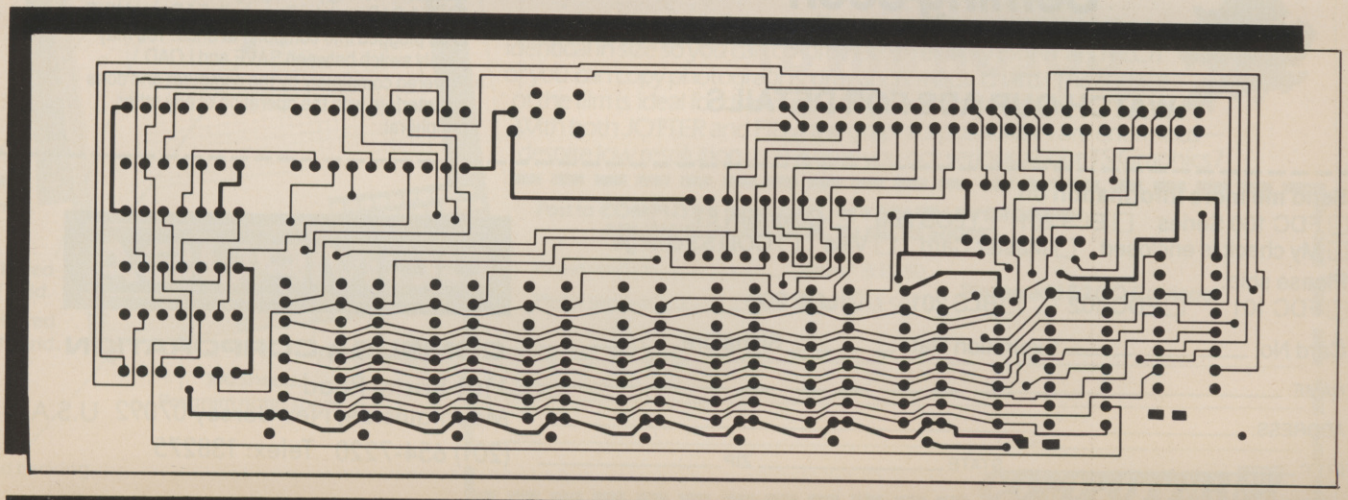
Once Ramkit is connected to the computer, after power-up, it latches onto the memory map by controlling both the ROM CS and RAM C/S lines. When Ramtop has been set, there is operational RAM for the selected areas shown by the user. Entry points to the monitor are still available.

Construction

If you are building the circuit board, use the layouts provided in this article. See Figures 2, 3 and 4.

The plastic case does not allow the usage of IC sockets due to sizing. Experienced builders should have no difficulty in soldering the chips directly onto the circuit board. We suggest that novices should first consult reading materials covering the basics of component soldering. Set up in a clear area away from carpets and static electricity; it never hurts to be near a well-grounded item such as a cold water pipe. Before you touch any component, discharge yourself of static by touching the electrical ground; my favorite on such occasions is the telephone — the bottom

Figure 2. *Component side of printed circuit board.*



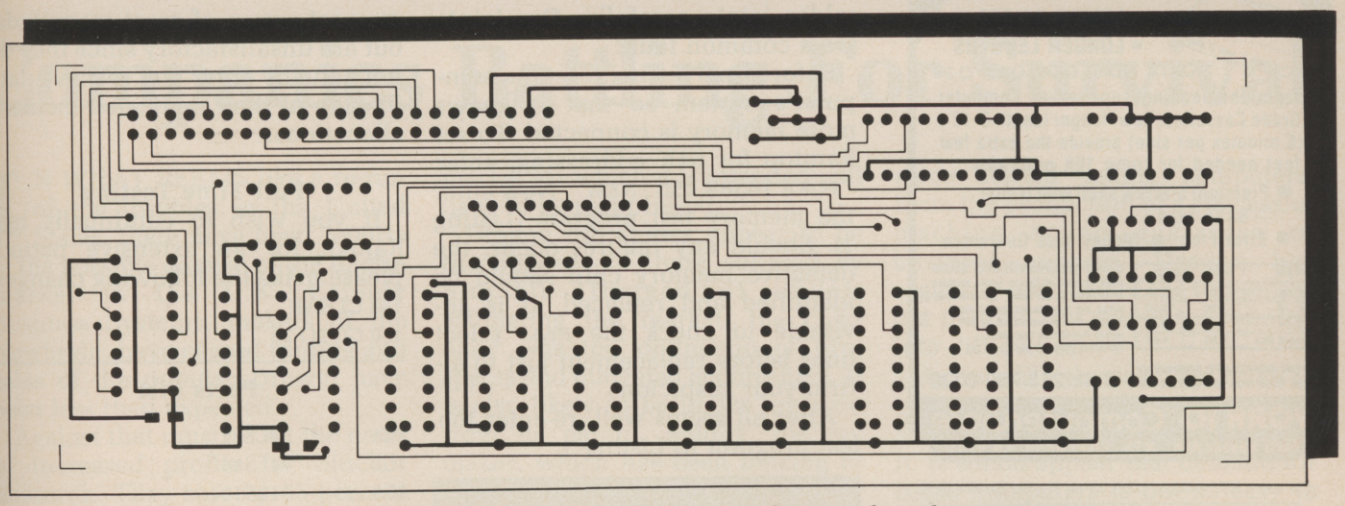


Figure 3. *Reverse side of printed circuit board.*

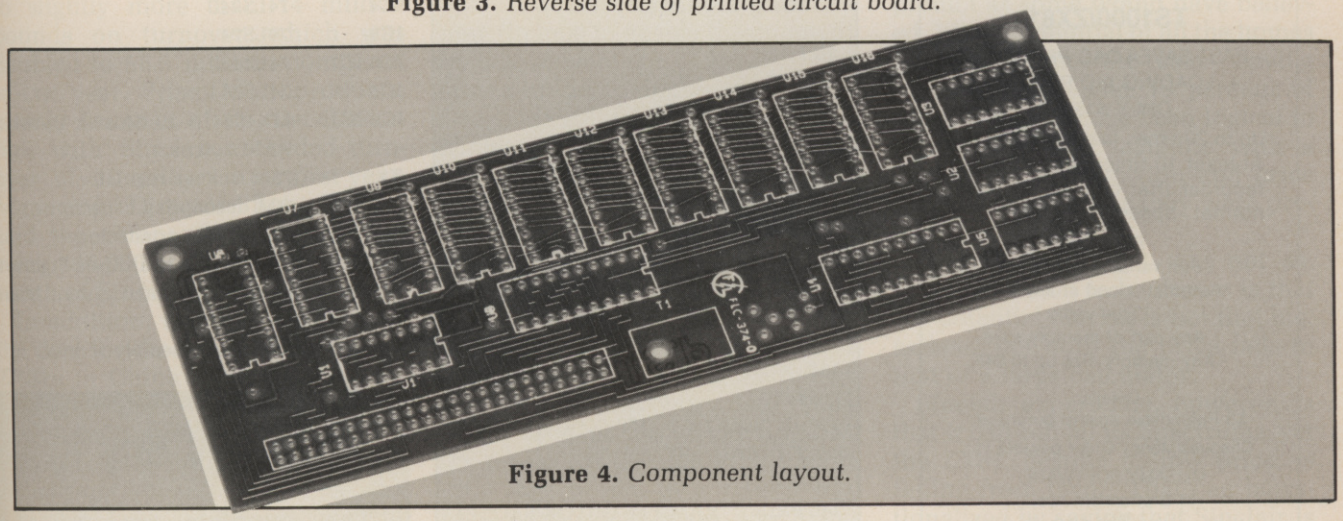


Figure 4. *Component layout.*

plate or metal stopper of the dialing mechanism on older telephones works very nicely. After you have collected your components together are ready to start, remember to take the time to properly identify each component and its proper positioning on the circuit board. Two common flaws in constructing electronic gear are a lack of precautionary handling and misplacement of components.

Insert each of the ICs first: simply fit them through the solder masked board into their respective positions. Bend a set of diagonally opposite pins of the IC to keep it from falling out before soldering. It is always best to bend a pin away from a close neighboring component whenever possible. This will aid you in preventing any hazardous solder bridges.

When all of the ICs have been mounted and their positions checked a final time, begin soldering. Mount and solder the rest of the components.

If you have collected your own components through various means, you probably have a length of edge connector which has to be cut down to size. Remember to insert a key in slot 3A/3B. This acts as the guide pin to allow for proper fitting of the RAM when completed.

An optional expansion buss has been included. Although it is not mandatory for Ramkit operation, it is still a good idea to add the extra printed circuit edge connector. After all, there is no sense in limiting your expansion capabilities where all other add-ons must be inserted before your 64K RAM.

Testing

Once final assembly is completed, it is time to try the new memory. Sinclair users with the standard 1-ampere power supply will have plenty of current to power up Ramkit. Owners of the earlier 650-ma. supplies are best advised to acquire the heavier unit before connecting their RAMs.

Ramkit will react visually as do other memory expansions. After powering your computer, there will be a quick glitch on the screen; shortly after, the cursor should appear in its normal position. If your RAM does not perform in this manner, quickly disconnect the power and check your construction. After verifying component layout, check

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solder joints carefully. Dry joints are a common fault.

Before final testing reset the computer's system so that it knows more memory is connected. To set Ramtop for 64K addressing, enter "POKE 16389,255 ; NEW". Now enter the memory test program (Listing 1). Should any failures occur, the defective memory chip should be identified and replaced. It is advisable to check the RAM select lines before replacement just to affirm your suspicions.

After all seems well, re-enter the test program in Listing 1.

Listing 1. *Memory Test*

```
10 FAST
20 CLS
30 LET X=VAL "256"
40 RAND
50 LET Y=X*RND
60 RAND Y
70 FOR I=VAL "17530" TO VAL
"65535"
80 POKE I,INT (X*RND)
90 NEXT I
100 RAND Y
110 FOR I=VAL "17530" TO VAL
"65535"
120 IF PEEK I < > INT (X*RND) THEN
PEEK I "FAILURE AT ";I
130 NEXT I
140 PRINT "RAM TESTED OK EXCEPT
WHERE LISTED"
150 STOP
```

Testing the full memory of Ramkit will take about half an hour. The VAL function is used here because of its unique reaction to stray values in variables. Whenever the T/S1000,ZX81 computer evaluates a numeric string with VAL, the expression must be completely true. If not, the basic operating system will crash the program. When doing a RAM test, it is most important to test each individual byte of memory. This may seem like common sense, as that should be the purpose of any memory check. Some manufacturers and technical writers prefer to use the dimensioning of large arrays (eg. DIM A(9000)). These tests may set arrays of great magnitude, but are unsatisfactory since they do not actually enter and retrieve data in each of their dedicated memory allocations.

Full Time Testing

If you wish to continually test Ramkit for an extensive period, please make the following changes:

```
140 CLEAR
150 GOTO 20
```

Parts List

IC1	74LS32
IC2	74LS86
IC3	74LS10
IC4	74LS240
IC5	74LS74
IC6,IC7	74LS157
IC8	74LS244
IC9-IC16	MK4564 N-20 Mostek Dynamic RAM 200 ns.
T1	7805 voltage regulator
C1-C12	.1M decoupling capacitors
J1	44-pin edge connector
PCB1	main layout board (see Figure 1)
EXT1	extension printed circuit board (see Figure 3)
	Case and assembly screws.

Where To Buy It

The complete package of components for Ramkit is available from Gladstone Electronics. The complete kit, including a case, costs $79.95 ($99.95 in Canada). A "barebones" kit consisting of a case, the main printed circuit board, edge card extension and 44-pin connector costs $24.95 ($29.95 in Canada). Ramkit is also available fully assembled for $99.95 ($149.95 in Canada). Please add $3 ($4.50 in Canada) to all orders for shipping and handling. Send your order with remittance to Gladstone Electronics, 1585 Kenmore Ave., Buffalo, N.Y. 14217. In Canada: Gladstone Electronics, 1736 Avenue Road, Toronto, Ontario M5M 3Y7.

Companies Battling For Survival

IN WHAT SEEMS like a re-run of the troubles in the United States, there have been reports of the possible demise of the micro-market in the U.K. Grundy Business Systems, makers of the Newbrain, have ceased trading and sales of the popular Dragon have been less than expected.

Against that must be set the news of increased profits for Sinclair Research. They rose by 65 percent to slightly more than 14 million pounds on turnover which was doubled to 55.5 million, compared to last year. Prism Microproducts, mainly because of its distribution link with Sinclair, recorded turnover of 10 million in its first year. Managing Director Bob Denton said the company is moving between 500,000 and 1 million pounds worth of Sinclair goods each week.

In addition, there is the news of the deal for the sale and making of ZX81s in China which opens vast new possibilities. The fact that the deal was agreed to so quickly shows how keen the Chinese must be to take advantage of this new piece of technology and join the computer age. Other business people who have tried selling in that market must be envious at the speed with which the business was transacted.

Despite the similarities between the United States and Britain, the underlying situation is different. The problems on your side of the Atlantic stem mainly from the continuing price war whereas the British difficulties are the result of particular conditions in which the companies find themselves.

Grundy was taking over a machine which was out of date by the time it was launched. What had been a new idea when it was conceived had been overtaken by the Sinclair machines, while its own future was being affected by delays. There is a chance that the Newbrain will survive but the market for which it is intended will have to be reappraised.

Dragon difficulties appear to be the opposite of those suffered by Sinclair. Instead of underestimating the market, the company was too optimistic of prospects and budgeted accordingly. It is also likely to be under pressure from its parent, Mettoy, the toy maker, which has been looking to Dragon to ensure its future. Last year it had to sell part of Dragon for new finance to enable the company to take advantage of growth prospects in the computer market, but Dragon is still its main source of income.

The lesson from both the problem companies seems to be that although there are great opportunities in the home computer market, it is not immune from the normal constraints of business. No one, not even Sinclair Research, can afford to ignore them, although Sinclair is probably in a better position than most. As it was first into the market, it has had a little more time than others to put itself into good shape, a process which has been proceeding since the company was started four years ago.

That kind of extra time does not exist for the companies which have since started selling computers. Even the production of a successful machine is no guarantee of business success. Dragon has regularly been one of the top-sellers but that did not prevent it running into difficulties.

As in all businesses, the route to success is to predict demand accurately and adjust supply to meet it. It would appear that demand for home computers is not so easy to predict as some would have believed. With a potential of all the homes in Britain and the sales having reached only about 10 percent of them, it would have been logical to expect that any machine with a reasonable specification and price would sell as fast as they were produced.

Dragon found that was not so. The conclusion to be drawn is that the potential market is not that big, as least not until the price falls to that of a large calculator.

Sinclair experience, however, is that it can sell all its Spectrums, yet the ZX81, despite its low price, is falling from favor. That can be rationalized by saying that Sinclair is in a class of its own and has found its niche in the market for a relatively low-cost machine with relatively high specifications.

The BBC Model B machine is in a similar situation but the rest are chasing what is left.

With more and more machines seemingly arriving every week, the chasing will become ever more frantic until the manufacturers that fail to get it right have to call it a day. It is unlikely that will happen before Christmas, given the pre-festive boom which can be expected. By this time next year, however, following the fall in sales in the beginning of the year, it could be that many of the less familiar names will no longer be with us.

— Nigel Clark
in London

Fred Blechman outlines the color capabilities of the T/S2068

Color Me Gorgeous!

Color Palette
(See Listing 1)

Color Mosaic
(See Listing 3)

T/S2068

Feature

ONE of the big new features of the Timex Sinclair 2068 personal computer, compared to the T/S1000 and T/S1500, is C-O-L-O-R! While color is not particularly important for most simple computer functions, it has become almost a necessity in games, together with sound. Our emphasis in this article is not on games, but there's no doubt that color can enhance almost any program. This article refers to the T/S2068. You'll learn enough about the color capabilities of the T/S2068 computer to allow you to become somewhat of a "pixelated Picasso."

The Color Signals

Although all the promotional information on the T/S2068 mentions eight colors, there is seldom mention of the fact that there are two distinct BRIGHTness levels, so there really is a perception of 16 colors.

First, however, we must clarify what can be colored and what cannot, and how well these colors can be viewed. For example, if you're using a black and white television as a display, then you will see colors as shades of gray — and even these won't show up too well unless you tune the brightness and contrast controls for the best distinction. (These control settings will probably not be the same as for the best television picture).

Using A Color TV Receiver

If you're using a color television set, you'll be feeding the 2068's "TV" modulated RF signal into the antenna switch box supplied with it. You'll be distracted by "crawlies", wiggly lines that are pervasive throughout the picture, and particularly noticeable on borders between colors, but you'll learn to live with them.

It's important that the antenna switch box has the switch in the "Computer" position and not the "TV" position. Also, be sure the channel selector is set to the same channel (2 or 3) as the switch under the T/S2068 and then tune for the clearest picture. If you don't get a good picture, try the other channel (remembering, of course, to move the switch under the 2068).

Color Monitor

If you use an NTSC (National Television Systems Committee standard used in the United States) color *monitor*, you'll have an improved display. Connect the video cable supplied with the computer from the computer's MONITOR output (on the back of the 2068) directly to the color monitor's video input. An adapter plug may be required if the monitor doesn't have an RCA-type video input jack. The antenna box is not used with a monitor. Using a monitor rather than a television set won't absolutely eliminate crawlies, but it greatly cuts down their population and size!

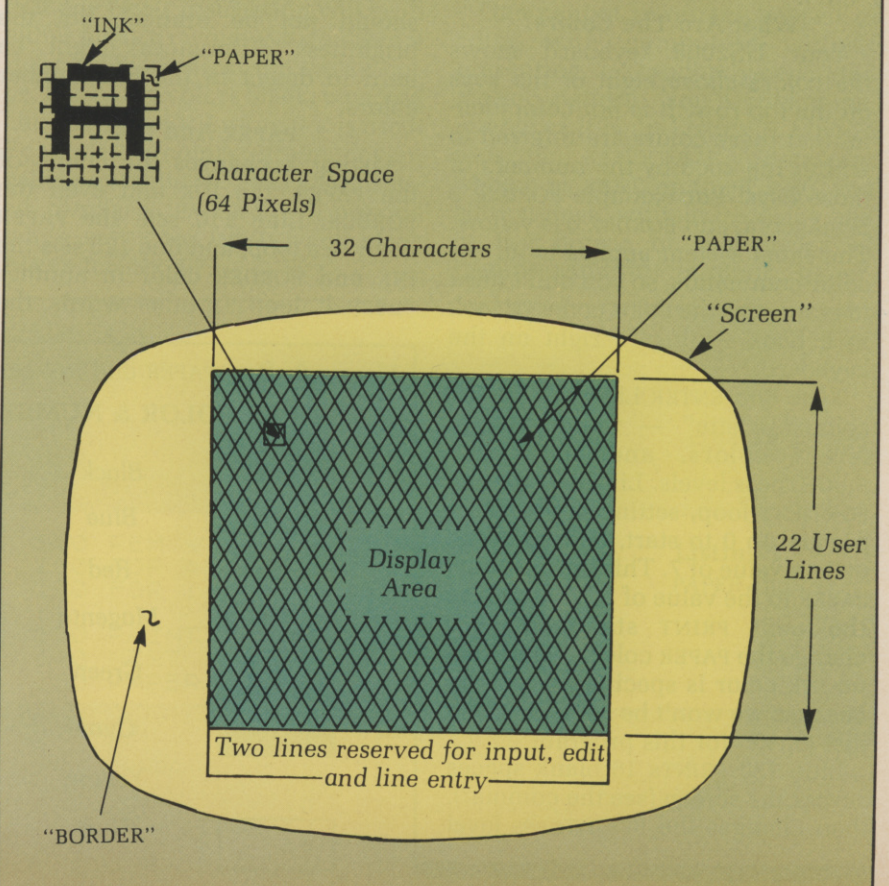
The Color Palette

There are various commands/statements that effect the color of the display and each picture element (pixel) on the display. Figure 1 shows the various areas of color and the associated BASIC control words. The BORDER, for example, surrounds the usable area of the display, and is controlled directly with the BORDER number. This can be done from the keyboard (which is then called a "command") or within a program (when it's called a "statement").

PAPER And INK

The usable area has a background color called PAPER, on which the printing occurs in an INK color, which certainly makes sense. So, whenever you PRINT anything, it's printed in the INK color on the

Figure 1. *Display.*



Note: This article is an excerpt from the author's new book, "Timex 2000 Beginner/Intermediate Guide" (Howard W. Sams & Co. Book #22225)

PAPER background of the usable area (22 lines) surrounded by the BORDER color. The additional two display lines, normally used for EDIT, INPUT and program line entry, are the current or previous BORDER color.

Each character space on the 32-character line has a PAPER color, and every pixel in that space (8 x 8 = 64) has that color unless PRINT, DRAW, PLOT, INVERSE or OVER have caused that pixel to assume the INK color. The most important thing to remember is that there is only *one* PAPER color and one INK color for the entire character space at any one time. Each PAPER or INK color can change, but then it affects every other PAPER or INK pixel, respectively, in that character space.

The other thing to understand is that each pixel can be in only one of two states — either the PAPER color (in which case it is sometimes referred to as "off") or the INK color ("on").

What Are The Colors?

Your T/S2068 keyboard shows the colors above eight of the keys on the top row. It is not coincidental that these colors are referred to within the 2068 by the numbers of those keys! For example BORDER 3 is magenta, and BORDER 6 is yellow. The same system applies to all the color commands, so you don't need to memorize the color codes or look in a book — they're right on the keyboard.

Type and ENTER Listing 1 for the color "palette" — the eight different colors, and their two BRIGHTness levels. Line 110 starts a FOR-NEXT loop, setting the variable p equal to 0 to start, and counting up to a value of 7. This line also sets PAPER to the value of p. That means the next PRINT statement will change the PAPER color. Notice that no INK color is specified — mainly because we won't be using any INK, just PAPER, for this program.

Line 120 PRINTs 16 blank spaces across the screen (see the comma?), then changes the BRIGHTness level to "1", or "on", then PRINTs another 16 spaces for the rest of the screen line, then goes back to BRIGHT 0 ("off"). Line 130 does exactly the same thing, but on the next screen line. Don't forget the commas after both PRINT statements in each line, or you'll get line feeds you don't want. Line 40, of course, simply goes back to increase the value of p in Line 110 if it has not yet reached 7. The result is you get two screen lines in each of the seven colors.

Notice that the left side of the screen shows the regular colors, in the sequence shown above the number keys, and the right side shows the same colors, but BRIGHTer. On a properly adjusted black and white television, you'll be able to distinguish not only the colors but the brightness levels except for the black. On a color television or NTSC monitor, this "palette" will allow you to adjust for the proper colors (the yellow, for example, should not be orange), but the brightness differences might be hard to detect in the low-number colors.

PAPER And INK

Listing 2 changes the colors of the PAPER, the INK and even the BORDER. Line 110 sets the PAPER color in a loop, and line 120 sets the INK and BORDER color in another "nested" loop. In other words, the INK/BORDER loop performs the line 130 PRINT statement eight times (for i values of 0 to 7, with p equal to 0), and then the NEXT p in line 140 does it all over again, but with p equal to 1. This continues until p finally exceeds 7, when the program "falls through the loop" to line 150, where the PAPER and INK colors are reset.

Which INK On Which PAPER?

Run this program (pressing Y or ENTER when "scroll?" appears at the bottom of the screen) and you'll see the many PAPER and INK combinations available (64 in this program) — and how many of them are almost unreadable! Obviously, in every case where PAPER and INK are the same color, you can't see the PRINTing, even though it's there. Figure 2 shows the suggested color combinations for best readability. Actually, if you don't need color for your application, it's very hard to beat black INK on white PAPER for legibility.

To FLASH Or Not To FLASH?

Another "attribute" that effects a character space is FLASH. Just to add excitement to this program, add line 125:

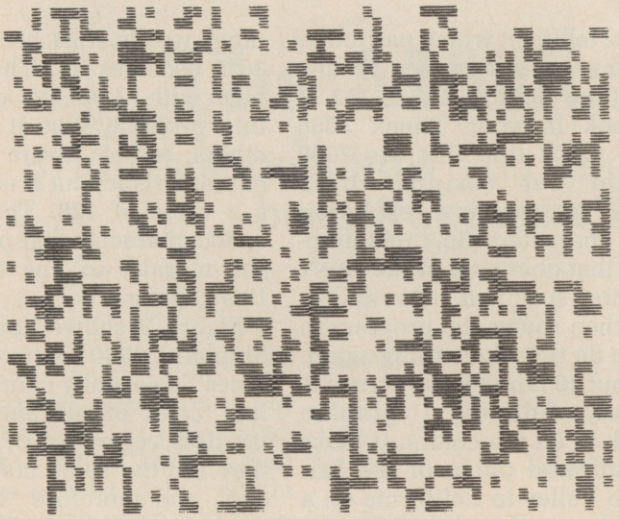
```
125 FLASH 1
```

Also, add FLASH 0 at the end of line 150 to reset the FLASH to "off" at the end of the program, so you can look at a listing without going batty. Now, run the program and

Figure 2. *Best PAPER and INK combinations for maximum legibility.*

PAPER COLOR & NUMBER			INK COLOR NUMBER
	Black	0	3,4,5,6,7
	Blue	1	4,5,6,7
	Red	2	6,7
	Magenta	3	0,6,7
	Green	4	0,1
	Cyan	5	0,1
	Yellow	6	0,1,2
	White	7	0,1,2,3

Figure 3. *How the printer sees the mosaic (ink only).*



you'll see each color FLASHing — but so much is going on, it's hard to tell exactly what's happening. If you watch closely, you'll see that each section of the screen changes its PAPER color to its INK color when it's FLASHing. However, this would make the PRINTing disappear, so the INK color changes to a contrasting color (black or white only) during the FLASH period. Then back to normal — all in about a half a second.

Use Y or ENTER to continue to the end of the program when "scroll?" appears at the bottom of the screen, and then press the L key for LIST. The program LISTing will appear, pushing up the colors — which keep on FLASHing! So, even if you move a FLASHing character, it keeps on FLASHing until you use FLASH 0 either from the keyboard or in the program. Another way of saying this is that the attributes (PAPER, INK, BRIGHT and FLASH) apply to the character when it was originated or last changed, not the screen location.

Attributes "8" And "9"

The number "8" may be used with PAPER, INK, FLASH and BRIGHT, but not with BORDER. The "8" is used as a precaution to keep from changing the existing attribute. PAPER 8, INK 8, FLASH 8 or BRIGHT 8 simply leave these attributes in the character attribute file as they were — no change. This is called a "transparent" instruction, since it allows the original attribute to continue. If you're putting something on the screen and you don't want to change its PAPER, INK, FLASH or BRIGHT mode, then use "8" (without the quotes, such as INK 8.)

The "9" is much more useful, but can only be used with PAPER and INK. If INK 9 is used, it assures you that any PRINT instruction will be in either black or white INK, to make it most visible against the PAPER color. For PAPER colors black, blue, red and magenta (0-3) *white* INK is used. For PAPER colors green, cyan, yellow or white (4-7) *black* INK is used. Similarly, PAPER 9 will provide white PAPER for INK 0-3 and black PAPER for INK 4-7.

Try It Yourself

So you don't believe the T/S2068 is really that smart? Well, here's a "four-liner" (that could be a "one-liner") to prove it. Use NEW to clear memory, then type ENTER, and run this short program:

```
10 FOR x=0 TO 7
20 PAPER x: INK 9
30 PRINT "Testing....."
40 NEXT x
```

Now, do you apologize? Pretty smart machine, eh? Actually, this mode is invoked in any character space where FLASH is "on", to assure PRINT legibility. This means in the regular mode, the PAPER and INK in a FLASHing space are as programmed, but when the FLASH occurs, the PAPER color becomes the INK color, and the INK color becomes either black or white, depending on the (now) PAPER color.

The Mandatory Mosaic

One cannot cover the subject of color with computers without presenting a randomly-generated mosaic pattern. You'll find mine, simple as it is, in Listing 3. Line 20 uses the RANDOMIZE statement (shown as RAND on the T key), and all that does, without exposing you to the horror of the theory of pseudo-random number gener-

Listing 1.
Color palette.

```
100 REM * Color Palette *
110 FOR p=0 TO 7: PAPER p
120 PRINT ;: BRIGHT 1: PRINT ;
BRIGHT 0
130 PRINT ;: BRIGHT 1: PRINT ;
BRIGHT 0
140 NEXT p
```

Listing 2.
PAPER and INK.

```
100 REM * Paper & Ink *
110 FOR p=0 TO 7: PAPER p
120 FOR i=0 TO 7: INK i: BORDER
i
130 PRINT "paper ";p;"/ink ";i;
140 NEXT i: NEXT p
150 PAPER 7: INK 0
```

Listing 3.
Color mosaic.

```
10 REM * Color Mosaic *
20 RANDOMIZE 0
30 LET x=RND*21: LET y=RND*31
40 LET z=RND*15+128
50 LET p=RND*7: LET i=RND*7
60 PAPER p: INK i: PRINT AT x,
y;CHR$ z
70 GO TO 30
```

ators, is to assure that you will never get the same pattern twice.

Line 30 picks random (RND) values (actually, pseudo-random values, but we decided to avoid that distinction) for variables x and y. The value of x can fall anywhere from 0 to 21, and y can be up to 31. Line 40 sets variable z equal to a number from zero to 15, plus 128, or a range of 128 to 143. You'll see why in a moment.

Let's skip line 45 for now. We'll come back to it. Line 50 sets variable p and i each to a number from 0 to 7. Line 60 does the real work, by printing a graphic character with PAPER color p, using INK color i at a screen location x rows down and y character spaces to the right of the upper left hand corner. Huh? Read it again if you're still confused.

But what "graphic character"? That's what CHR$ is for, with variable z telling it which particular character. Variable z can be any number (line 40) from 128 to 143. If you'll look in your Timex 2068 Manual, you'll find that the 2068 character set assigns these numbers to the low-resolution graphics characters. So, CHR$ simply prints that character at the PRINT AT position specified by x and y. Line 70 then routes the program to line 30 to do the whole thing again. After about 10 minutes the screen is completely full of a graphic quiltwork in all the colors. It looks like an infrared photo of the San Fernando Valley in California on a summer day, with red (hot) houses and blue (cool) pools . . .

Oh, you still want to know about line 45, huh? Well, it just so happens that PAPER, INK, PRINT AT and CHR$ are all smart enough to round-off random numbers up or down to the nearest integer. In other words, 13.4 becomes 13, but 13.5 becomes 14. This is no problem with PAPER, INK or PRINT AT in this program (but it could be in others, so be aware of this odd characteristic) but it could produce a z value of 128. This is a blank space character that pokes holes in the mosaic, so line 45 eliminates this chance.

Figure 3 shows how the Timex Sinclair 2040 Personal Printer "sees" a partially complete mosaic. It's "color blind" and only prints INK dots, regardless of color (even if they are the same color as PAPER dots, and therefore "invisible" on the screen!).

What If You're Color Blind?

If you are part of the population that is color-blind, it doesn't matter anyhow . . . In fact, this whole article could have been skipped! ("Now he tells me . . .")

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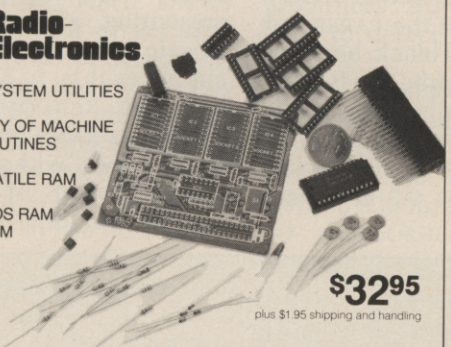

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What a super product!...conceived and executed very nicely...and with quality components.
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8K Nonvolatile memory is a gem! It has so many possible uses...I recommend this board most heartily.
(OKLAHOMA S.U.G. Newsletter 1/3)

We found the documentation to be far superior to that (of) most hardware we've received.
(S.U.N. Newsletter Nov/Dec 82)

For versatility this is even better than an EPROM...ranks quite high on the list of "must-haves"...
(SYNC Magazine Mar/Apr 83)

Provides the user with instant software...an extremely versatile memory extension...
(Z-WEST June 83)

INTRODUCTION

This memory board is designed to fill the transparent 8K block of memory (from 8K to 16K) in a ZX81-16K system. This area of memory is an ideal place to store, either permanently or temporarily, machine language routines or data which are to be used by the BASIC system.

Sample utilities are included with the kit.

The use of HM6116LP 2K CMOS RAM memory IC's with their own reserve power supply means that routines stored in the RAM are nonvolatile — the RAM retains its memory even when the ZX81 is switched off or reset. Moreover, being RAM, the routines you store in the memory are easily modified. The lithium cell supplied with the board will maintain sufficient reserve power for almost ten years.

ASSEMBLY

Complete step-by-step instructions in a 20 page manual make assembly of the board easy. The kit (pictured above) is complete with a silkscreened solder-masked printed circuit board, all capacitors, resistors, transistors, sockets, connectors, integrated circuits, and the lithium cell. The board is supplied with one 2K CMOS 6116LP-3 RAM — it will accomodate three more for a total of 8K.

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Feature

The Music Maker

Neal Bridges shows how you and your T/S,ZX can make beautiful music together

MUSIC MAKER is a new editing program that allows you to play music on the 16K T/S1000,ZX81. Up to seven songs can be stored within the program, each up to 200 notes in length. Only one voice is available, however, and this limits the program to playing simple melodies. You control the duration of each note and the tempo of each song.

Entering The Program

The program must be entered in two sections. First, type in Listing 1 for the first program, and run this program. Then delete all program lines except line 0, which contains a machine language routine that makes music; it can't be deleted, anyway. Here is the assembly language listing:

```
        LD H,0A         ;tempo
LOOP1   LD L,56         ;duration
LOOP2   LD BC,1301      ;tone code
        PUSH BC
        OUT(FF),A
        CALL PAUSE
        POP BC
        IN A,(FE)
        CALL PAUSE
        DEC L
        JR NZ LOOP2
        DEC H
        JR NZ LOOP1
        RET
PAUSE   INC B
        DEC B
        JR Z CHKC
WAIT    DJNZ WAIT
CHKC    INC C
        DEC C
        RET Z
        DEC C
        JR WAIT
```

The sound can be heard in three ways. The first is the best:

(1) Connect a high gain amplifier to the MIC lead coming from the computer. A cassette recorder that allows you to monitor what is being recorded is suitable.

(2) Increase the volume of your television. Some retuning may be necessary for the best sound quality.

(3) Place an AM radio near the television while the music is being produced. The radio should be tuned to a very weak station. The music can then be heard through the radio.

To test the machine language in line 0, use one of the above methods to hear the steady buzz of the television, then type RAND USR 16514. This should produce a pitch of A above middle C, or 440 Hz, lasting for about two seconds. While the sound is being produced, a number of thick black bars will be visible on the screen, similar to the patterns produced during LOADs and SAVEs. After the tone has been produced, your normal television picture will reappear.

If you achieved the above results, you may proceed to type in the second program, Listing 2. This is the music editing program. Once it is entered, type RUN, and read the operating instructions.

Operating Instructions

When the program is RUN or LOADed from tape, the menu will be displayed. There are 15 options to

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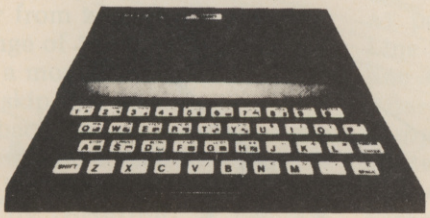

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SAMPLE

THIS MONTHS SMALL WONDER IS A MOVING GRAHPICS DISPLAY THAT MAKES AN IMPRESSIVE PROGRAM INTRODUCTION.

```
  10 SLOW
  20 FOR L=1 TO 22
  30 PRINT "▌▌▌▌▌▌▌▌SMALL WONDER
S▌▌▌▌▌▌▌▌"
  40 NEXT L
  50 PAUSE 100
  60 CLS
```

IF YOU WISH TO USE SMALL WONDER WITH AN EXISTING PROGRAM, THAT DOES NOT ALLOW INSERTION OF 6 LINES, THEN WRITE IT IN AS A SUB-ROUTINE. E.G.:

```
   1 GOSUB 9990
9990 SLOW
9991 FOR L=1 TO 22
9992 PRINT "▌▌▌▌▌▌▌▌SMALL WONDER
S▌▌▌▌▌▌▌▌"
9993 NEXT L
9994 PAUSE 100
9995 CLS
9996 RETURN
```

NOTE: Add Copy Space Does Not Allow Us Room To Print A Lengthier Presentable Program

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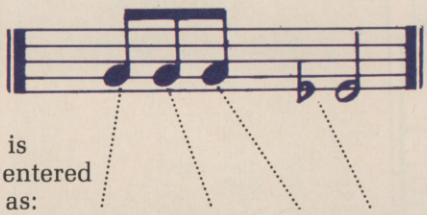
choose from; what follows is a description of each.

NEW SONG (press B). This will erase the current song. If the song has been STOREd the stored copy will not be affected. The title of the current song is reset to "NOT LISTED", and the present tempo is reset to 10.

WRITE (press F). The length of the current song is displayed, along with the last note entered when in the WRITE mode. If no notes have been entered, the last note entered will be displayed as "_____". If the song has been STORED, or is greater than 199 notes in length, "? SONG FULL ERROR" will be displayed at the bottom of the screen. This is an *error message.*

Note: If at any time an error message is received, pressing any program to continue. If the song is not full, you will see an input prompt. Each tone and duration that the program can produce has its own code. See the chart accompanying this article for a list of tone and duration codes. Notes are entered using these codes.

For instance, this familiar tune:



is entered as:

"13502	13502	13502	18808"
G	G	G	Eb

No spaces are entered. A note is entered as a three-digit tone code. The duration code can be a value from one to 99. A string of notes can be entered in one go. However, if any of the notes in the string take up more or less than five characters, "? INCORRECT ENTRY ERROR" will be displayed, and all the notes entered in that string will be lost.

To return to the menu, simply press ENTER instead of entering a note.

EDIT (press E). This option allows you to change the tone and duration of a single note. Enter the number of the note that you wish to change. For example, if you wished to change the Eb in the above example, you would enter 4 to indicate the fourth note in the song. END may also be entered if the song has not been stored. END refers to the last note in the song. Expressions such as END — 5" are also accepted. If the value entered is less than 1 or greater than the length of the song, "? NOTE OUT OF RANGE ERROR" will be displayed. If the entry is within range of the current song, the tone and duration codes for that note will be displayed on the screen. You may enter the new values for this note, using the same format as in the "WRITE" mode. If you do not wish to enter the new values, pressing ENTER will return you to the menu.

DELETE (press H). This option enables you to delete a single note or a group of notes from the current song. The notes specified in the "FROM NOTE" and "TO NOTE" entries will also be deleted. Expressions using "END" are also accepted.

For example, if you wish to delete note four from the current song, enter the value of 4 for both the "FROM NOTE and "TO NOTE" entries. If the notes you enter are out of range, "? NOTE OUT OF RANGE ERROR" will appear.

INSERT (press I). This option allows you to insert a note in the current song. Enter the note before which you wish to insert a new value. Expressions using END are accepted. If the value you enter is out of range, "? NOTE OUT OF RANGE ERROR" will be displayed. Otherwise, you will be able to insert a new note before the specified note.

PLAY (press A). This option will play the current song. The title of the current song will be displayed on the screen. If the song is empty, "? INCORRECT SONG LENGTH ERROR" will be displayed. If the song does exist, however, the preset tempo of the song will be listed next to an input block. If you

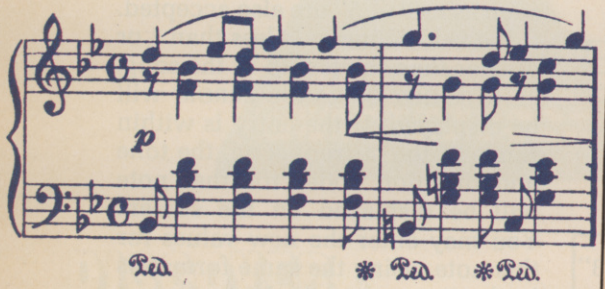
Duration Codes.

Symbol	Value	Code
	1/16	01
	1/8	02
	1/4	04
	1/2	08
	Whole	16

Tone Codes.

	(High)		Octave		(Low)	
Tone	1	2	3	4	5	
C	072	0E8	1D2	3A7	769	*(High)*
C#:DF	06B	0DB	1B8	372	6FA	
D	065	0CF	19F	341	691	
D#:EF	05F	0C3	188	311	623	
E	059	0B7	171	2E6	5DA	
F	054	0AD	15C	2BC	582	
F#:DF	04F	0A3	148	295	532	
G	04A	09A	135	26E	4E4	
G#:AF	046	091	124	24B	49B	
A	042	088	113	22A	45A	
A#:BF	03E	080	103	20B	417	
B	03A	079	0F7	1EE	3E1	
C	037	072	0E8	1D2	3A7	*(Low)*
Rest	Off					

type in a value from 1 to 99, the song will be played at this tempo; 1 is very fast, and 99 is very slow. If ENTER is pressed instead of entering a value, the song will be played at the present tempo displayed next to the input block. If the title of the song is "NOT LISTED", the preset tempo will be 10. Values around 10 are suitable for most songs.



LIST (press N). This option enables you to list one or more notes in the current song. Enter from which note and to which note you wish to be listed, and whether or not a printout is required. If either of the note entries is out of range, "? NOTE OUT OF RANGE ERROR" will be displayed.

After the screen has been filled, pressing any key except BREAK will allow you to continue with the listing. At this point, if the printer option was chosen, the screen will be copied onto the printer. After the listing is complete, you will be returned to the menu.

DUPLICATE (press G). This option allows you to duplicate a previously entered section of the current song, to avoid retyping frequently-used phrases of notes. Enter from which note and to which note you wish to be duplicated. These notes will be added to the end of the current song.

STORE (press M). This option allows you to store the current song in the computer's memory; a maximum of seven songs can be stored within the program. If seven songs have already been stored, "? OUT OF RAM SPACE ERROR" will be displayed when this option is chosen. Otherwise you may enter the name of the current song (up to 25 characters in

Listing 1.

```
   1 REM 12345678901234567890123
4567890123456789
  10 LET A$="260A2E560101130E0D3F
FCD9E10C1DBFECD9C4002D20EE2620E9C
9040526021DFE000DC080D18F8"
  20 LET X=16514
  30 FOR I=1 TO LEN A$-1 STEP 2
  40 POKE X,16*CODE A$(I)+CODE A
$(I+1)-476
  50 LET X=X+1
  60 NEXT I
  70 POKE 16510,0
```

Listing 2.

```
   1 REM <<< MUSIC MAKER >>>
   2 REM (C)1983 B. NEAL BRIDGES
   3 REM DATE= 83-06-04
   4 REM VERSION 2
   5 FAST
  10 LET A$="                <<< MUSIC MAK
ER >>>"
  15 LET O=10
  20 LET MENU=1E3
  30 LET S=0
  40 DIM T$(7,602)
  50 DIM N$(3,25)
  60 LET Q=3
  70 LET N$(8)="NOT LISTED"
  80 LET N=8
  90 LET S$=STR$ O
 100 LET P$="-----"
1000 REM MENU
1005 CLS
1010 IF O THEN SLOW
1020 PRINT A$;,,TAB 12;" MENU "
;TAB O;"<A> PLAY";TAB O;"<B> NEW
 SONG";TAB O;"<C> CHOOSE";TAB O;
"<D> REPLACE";TAB O;"<E> EDIT";T
AB O;"<F> WRITE";TAB O;"<G> DUPL
ICATE";TAB O;"<H> DELETE";TAB O
;"<I> INSERT";TAB O;"<J> SAVE";T
AB O;"<K> FAST ";TAB O;"<L> SLOW
";TAB O;"<M> STORE";TAB O;"<N>
LIST ";TAB O;"<O> EXIT";,,"SONG:
";N$(N)
1180 GOSUB 8E3
1200 IF Q$="A" THEN GOTO 1500
1205 IF Q$="B" THEN GOTO 80
1210 IF Q$="C" THEN GOTO 3500
1215 IF Q$="D" THEN GOTO 4200
1220 IF Q$="E" THEN GOTO 2500
1230 IF Q$="M" THEN GOTO 4E3
1235 IF Q$="I" THEN GOTO 2300
1240 IF Q$="N" THEN GOTO 3E3
1250 IF Q$="J" THEN GOTO 5E3
1253 IF Q$="O" THEN POKE 16384,2
3
1255 IF Q$="G" THEN GOTO 8500
1258 IF Q$="H" THEN GOTO 8700
1260 IF Q$="F" THEN GOTO 2E3
1265 IF Q$="K" THEN LET Q=0
1270 IF Q$="L" THEN LET Q=1
1275 IF Q THEN SLOW
1280 IF NOT Q THEN FAST
1285 GOTO 1180
1500 REM PLAY
1510 CLS
1530 PRINT A$;,,TAB 12;" PLAY "
1540 PRINT ,,,"SONG: ";N$(N)
1545 IF LEN S$=2 OR (LEN S$-2)/3
<>INT ((LEN S$-2)/3) THEN GOTO 1
720
1550 PRINT ,,,,"TEMPO ?     ("+S$
(TO 2)+")"
1553 LET X=8
1555 LET Y=X
1560 GOSUB 9500
1565 IF Q$<>"" THEN POKE 16515,V
AL Q$
1570 IF Q$="" THEN POKE 16515,VA
L S$(TO 2)
1610 FAST
1620 FOR I=3 TO LEN S$-2 STEP 3
1640 POKE 16519,CODE S$(I)
1660 POKE 16520,CODE S$(I+1)
1670 IF NOT PEEK 16520 THEN GOTO
 1702
1680 POKE 16517,CODE S$(I+2)+1E3
/(256+PEEK (16519)+PEEK 16520
1686 IF NOT PEEK 16517 THEN POKE
 16517,1
1688 POKE 16529,255-(PEEK 16520(
>255)
1690 LET A=USR 16514
1700 NEXT I
1710 GOTO MENU
1720 GOSUB 9730
1740 GOTO MENU
2000 REM WRITE
2010 CLS
2030 PRINT A$;,,TAB 12;" WRITE "
2035 LET Q$=""
2040 PRINT AT 4,0;"LENGTH OF SO
G: ";(LEN S$-2)/3;" NOTES"
2045 PRINT AT 6,0;"LAST ENTRY:
";P$
2047 IF Q THEN SLOW
2055 IF LEN S$>600 THEN GOTO 21
0
2060 IF Q$="" THEN INPUT Q$
2070 IF Q$="" THEN GOTO MENU
2085 FAST
2086 IF LEN Q$/5<>INT (LEN Q$/5
) THEN GOTO 2190
2120 LET S$=S$+CHR$ (VAL Q$(1)*
16+CODE Q$(2))+CHR$ (VAL Q$(3)*1
6+CODE Q$(4))+CHR$ (VAL Q$(5 TO
))
2125 LET P$=Q$(5 TO 5)
2130 LET Q$=Q$(6 TO )
2140 GOTO 2055-(15 AND Q$="")
2150 GOSUB 9750
2170 GOTO 2035
2180 GOSUB 9770
2600 GOTO MENU
2300 REM INSERT
2310 CLS
2315 LET END=(LEN S$-2)/3
2320 PRINT A$;,,TAB 11;" INSERT
"
2330 PRINT ,,"BEFORE NOTE ?"
2340 INPUT Q$
2350 IF Q$="" THEN GOTO MENU
2355 LET I=INT VAL Q$
2356 IF I<1 OR I>LEN S$-2)/3 TH
EN GOTO 2400
2357 LET S$=S$( TO I+3-1)+"
$(I+3 TO )
2360 LET I=I+3+1
2370 PRINT AT 4,0;"ENTER VALUE T
O BE INSERTED"
2380 GOTO 2850
2400 GOSUB 9790
2410 GOTO 2300
2500 REM EDIT
2510 CLS
2515 LET END=(LEN S$-2)/3
2530 PRINT A$;,,TAB 12;" EDIT "
2540 PRINT AT 4,0;"NOTE TO EDIT
?"
2550 INPUT Q$
2560 IF Q$="" THEN GOTO MENU
2570 LET I=INT VAL Q$
2580 IF I<1 OR I>(LEN S$-2)/3 TH
EN GOTO 2720
2590 PRINT AT 4,12;"  ";I
2600 PRINT AT 6,0;"TONE: ";CODE
S$(I+3)
2610 LET I=I+3+1
2620 GOSUB 9600
2630 PRINT H$;AT 8,0;"DURATION:
";("0" AND CODE S$(I+1)<CODE S$(I+1)
2640 PRINT AT 16,0;"ENTER NEW VA
LUES FOR NOTE ";VAL Q$
2650 INPUT Q$
2655 IF LEN Q$<>5 THEN GOTO 2650
2660 IF Q$="" THEN GOTO MENU
2670 LET S$(I-1 TO I+1)=CHR$ (VA
L Q$(1))+CHR$ (16*CODE Q$(2)+COD
E Q$(3)-476)+CHR$ (VAL Q$(4 TO 5
))
2710 GOTO MENU
2720 GOSUB 9790
2740 GOTO 2550
3000 REM LIST
3010 CLS
3015 LET END=(LEN S$-2)/3
3030 PRINT A$;,,TAB 12;" LIST "
3040 PRINT AT 4,0;"FROM NOTE ?"
3050 INPUT Q$
3060 IF Q$="" THEN GOTO MENU
3070 LET A=INT VAL Q$
3080 IF A<1 OR A>(LEN S$-2)/3 TH
EN GOTO 3290
3090 PRINT AT 4,0;A
3100 PRINT AT 6,0;"TO NOTE ?"
3120 INPUT Q$
3130 IF Q$="" THEN GOTO MENU
3134 LET B=INT VAL Q$
3135 PRINT AT 6,6;B
3141 IF B<1 OR B>(LEN S$-2)/3 OR
 B<A THEN GOTO 3290
3142 PRINT AT 8,0;"PRINTER Y/N ?
"
3143 GOSUB 8E3
3145 IF Q$<>"Y" AND Q$<>"N" THEN
 GOTO 3143
3160 FAST
3165 CLS
3167 LET N1=0
3170 FOR I=A+3 TO B+3+2 STEP 3
3175 IF NOT CODE S$(I+1) THEN GO
TO 3270
3180 PRINT TAB 0;(" " AND I/3<0)
+(" " AND I/3<(100);I/3;TAB 5;COD
E S$(I);
3190 LET I=I+1
3200 GOSUB 9600
3210 LET I=I-1
3215 LET N1=N1+1
3220 PRINT H$;TAB 0;("0" AND COD
E S$(I+2)<0);CODE S$(I+2)
```

```
3230 IF N1/22<>INT (N1/22) THEN
GOTO 3260
3235 POKE 16437,255
3240 PAUSE 4E4
3245 IF Q$="Y" THEN COPY
3250 CLS
3260 NEXT I
3265 POKE 16437,255
3270 IF N1/22<>INT (N1/22) THEN
PAUSE 4E4
3275 IF Q$="Y" AND N1/22<>INT (N
1/22) THEN COPY
3276 IF Q THEN SLOW
3280 GOTO MENU
3290 GOSUB 9730
3310 GOTO 3E3
3500 REM CHOOSE
3505 IF N$(1)=""
" THEN GOTO 1180
3510 CLS
3530 PRINT A$;,,TAB 11;" CHOOSE
"
3535 PRINT AT 4,0;"TITLES:";AT 5
,0;"
"
3540 FOR I=1 TO 5
3550 PRINT AT I+6,0;CHR$ (I+28)+
".";+CHR$ (146+(I=N))+N$(I)
3560 NEXT I
3570 PRINT '''"ENTER THE NUMBER
OF YOUR CHOICE"
3572 LET X=I+6
3574 LET Y=NOT X
3580 GOSUB 9500
3590 IF Q$="" THEN GOTO MENU
3600 LET N1=VAL Q$
3610 IF N1<1 OR N1>5 THEN GOTO 3
650
3615 LET N=N1
3620 LET S$=""
3630 LET S$=T$(N)
3640 GOTO MENU
3650 GOSUB 9810
3670 GOTO 3580
4000 REM STORE
4010 CLS
4030 PRINT A$;,,TAB 12;" STORE "
4035 IF S>6 THEN GOTO 4130
4040 PRINT AT 4,0;"WHAT IS THE N
AME OF THE SONG ?"
4050 INPUT Q$
4060 IF Q$="" THEN GOTO MENU
4062 IF LEN Q$>25 THEN GOTO 4050
4065 LET S=S+1
4070 LET N$(S)=Q$
4075 PRINT AT 6,0;"NAME: "+N$(S)
4080 PRINT AT 8,0;"PRESET TEMPO
?"
4090 LET X=8
4092 LET Y=15
4094 GOSUB 9500
4095 IF LEN Q$=1 THEN LET Q$="0"
+Q$
4100 LET T$(S)=Q$( TO 2)+S$(3 TO
)
4110 LET N=S
4120 GOTO MENU
4130 GOSUB 9830
4150 GOTO MENU
4200 REM REPLACE SONG
4210 CLS
4220 PRINT A$;,,TAB 11;" REPLACE
"
4230 PRINT AT 4,0;"NAME OF SONG
TO BE REPLACED ?"
4240 INPUT Q$
4245 IF Q$="" THEN GOTO MENU
4250 LET Q$=(Q$+"
" TO 25)
4255 LET N1=0
4257 FAST
4260 FOR I=1 TO 7
4270 IF N$(I)=Q$ THEN LET T$(I)=
S$
4275 IF N$(I)=Q$ THEN LET N1=I
4280 NEXT I
4285 IF Q THEN SLOW
4290 IF N1>0 THEN GOTO 4330
4300 PRINT AT 6,0;"FILE NOT FOUN
D"
4310 PAUSE 4E4
4320 GOTO MENU
4330 PRINT AT 6,0;"FOUND "+N$(N1
) AT 8,0;"REPLACED";AT 0,0;"WHAT
 IS THE NEW TITLE ?"
4340 INPUT Q$
4350 IF Q$="" THEN GOTO 4340
4355 IF Q$="SAME" THEN GOTO 4370
4360 LET N$(N1)=Q$
4370 LET X=12
4380 LET Y=X
4390 PRINT AT X,0;"NEW TEMPO ?"
4400 GOSUB 9500
4410 IF Q$="" THEN GOTO MENU
4420 LET T$(N1)=(T$(N1) TO 2)+Q$
4430 LET S$=(S$ TO 2)+Q$
4450 GOTO MENU
5000 REM SAVE
5010 CLS
```

```
5030 PRINT A$;,,TAB 12;" SAVE "
5040 PRINT AT 4,0;"FILENAME ?"
5050 INPUT Q$
5060 IF Q$="" THEN GOTO MENU
5080 SAVE Q$
5090 GOTO MENU
8000 REM ONE-LETTER INPUT
8010 POKE 16437,255
8015 IF NOT Q THEN PAUSE 4E4
8020 LET Q$=INKEY$
8030 IF Q$="" THEN GOTO 8010
8040 RETURN
8500 REM DUPLICATE
8510 CLS
8515 LET END=(LEN S$-2)/3
8520 PRINT A$;,,TAB 0;" DUPLICAT
E "
8530 PRINT AT 4,0;"FROM NOTE ?"
8540 INPUT Q$
8542 IF Q$="" THEN GOTO MENU
8545 LET A=INT VAL Q$
8547 IF A<1 OR A>(LEN S$-2)/3 TH
EN GOTO 8610
8548 PRINT AT 4,0;A
8550 PRINT AT 6,0;"TO NOTE ?"
8630 INPUT Q$
8631 IF Q$="" THEN GOTO MENU
8635 LET B=INT VAL Q$
8637 IF B<1 OR B>(LEN S$-2)/3 OR
 B<A THEN GOTO 9810
8590 LET S$=S$+S$(A*3 TO B*3+2
8595 IF LEN S$>602 THEN LET S$=S
$ TO 602)
8600 GOTO MENU
8610 GOSUB 9730
8620 GOTO 8500
8700 REM DELETE
8710 CLS
8720 LET END=(LEN S$-2)/3
8730 PRINT A$;,,TAB 11;" DELETE
"
8740 PRINT AT 4,0;"FROM NOTE ?"
8750 INPUT Q$
8752 IF Q$="" THEN GOTO MENU
8755 LET A=INT VAL Q$
8760 IF A<1 OR A>(LEN S$-2)/3 TH
EN GOTO 8830
8765 PRINT AT 4,0;A
8770 PRINT AT 6,0;"TO NOTE ?"
8780 INPUT Q$
8785 IF Q$="" THEN GOTO MENU
8790 LET B=INT VAL Q$
8800 IF B<1 OR B<A OR B>(LEN S$-
2)/3 THEN GOTO 8830
8810 LET S$=S$( TO A*3-1)+S$(B*3
+3 TO )
8820 GOTO MENU
8830 GOSUB 9730
8840 GOTO 8740
9000 REM ERROR PRINT
9010 POKE 16418,0
9020 PRINT AT 23,0;"? "+E$+" ERR
OR"
9021 POKE 16437,255
9022 PAUSE 4E4
9023 PRINT AT 23,0;"
"
9030 POKE 16418,2
9050 RETURN
9500 REM NUMBER INPUT
9502 PRINT AT X,Y;" "
9504 FAST
9505 LET Q$=""
9510 POKE 16437,255
9515 PAUSE 4E4
9520 LET Z$=INKEY$
9525 IF Z$=CHR$ 118 THEN GOTO 95
70
9526 IF Z$=CHR$ 119 THEN GOTO 95
02
9530 IF LEN Q$=2 OR Z$<"0" OR Z$
>"9" THEN GOTO 9510
9540 LET Q$=Q$+Z$
9550 PRINT AT X,Y;(" " AND LEN Q
$=1);Q$
9560 GOTO 9510
9570 IF Q THEN SLOW
9580 RETURN
9600 REM HEX FROM CODE
9610 LET H$=CHR$ (INT (CODE S$(I
)/16)+28)
9620 LET H$=H$+CHR$ ((CODE S$(I)
-(CODE H$-28)*16)+28)
9630 RETURN
9700 REM ERROR MESSAGES
9730 LET E$="INCORRECT SONG LENG
TH"
9740 GOTO 9E3
9750 LET E$="INCORRECT ENTRY"
9760 GOTO 9E3
9770 LET E$="SONG FULL"
9780 GOTO 9E3
9790 LET E$="NOTE OUT OF RANGE"
9800 GOTO 9E3
9810 LET E$="UNLISTED SONG"
9820 GOTO 9E3
9830 LET E$="OUT OF RAM SPACE"
9840 GOTO 9E3
```

length), and the tempo at which it sounds best. It will then be stored in the memory.

CHOOSE (press C). This option will list the songs that have been stored so far, and allow you to choose one of them to become the current song. If no songs have been stored, pressing C will have no effect. The titles are listed on the screen and you may enter the number of your choice. If your choice is less than 1 or greater than the number of songs listed, "? UNLISTED SONG ERROR" will be displayed.

REPLACE (press D). If you have EDITed a previously STORED song, you can replace the stored song using this option. Enter the title of the song that you wish replaced by the current song. If no such title exists, "FILE NOT FOUND" will be displayed; if it does exist, 'FOUND (name of song)" "REPLACED" will be displayed. The stored song will have been replaced by the edited song. You may enter a new title. If "SAME" is entered, the title will not be changed. A new tempo may then be entered, or, if only ENTER is pressed, the tempo will not be changed, and you will be returned to the menu.

FAST (press K). This will switch the program into the FAST mode.

SLOW (press L). This switches the program into the SLOW mode. When in the slow mode, the program will switch into the FAST mode when necessary.

SAVE (press J). This option will save the program, along with all stored songs, on cassette tape. Type the name that you wish to call the program. Start the recorder recording, and press ENTER. After saving, you will be returned to the menu.

EXIT (press 0). This will break out of the program with the error code of 0/1255.

If the program should ever stop for any reason, do *not* type RUN to restart it, as this will erase all the stored songs. Type GOTO MENU instead. 0/0

Bulletins

Power Controller

Intercontroller is a device that enables yo to use the immense power of your computer around the clock to perform tasks in the home, office, workshop or laboratory. Plug it into your computer, then use a few simple BASIC commands to program each of the unit's four grounded socket outlets, and plug electrical devices into the outlets. Intercontroller is available for $99.95 in stores nation-wide and from Intercomputer, Inc., 358 Chestnut Hill Ave., Boston MA 02146. (Add $4.95 s&h.) Intercomputer also plans to introduce other user-friendly controllers such as a remote control voice recognizer.

ON-SCREEN CATALOG

Compucat is out of the bag. Compucat is the one and only catalog that is inside your computer — not just on paper. That's right, Compucat is itself a software program that you load into your T/S1000,ZX81. It occupies almost 16K of memory. This Timextown computer products catalog even has an on-screen order blank program facility, which can list and total up the order and print a copy of it out onto the printer for mailing in. How about that? Their special debut programs include the "Crashmaster", which prints a controlled crash artwork pattern onto the Timex 2040 printer. For further information about Compucat and other hi-tech software contact: Timextown, POB-318, Nfld., NJ 07435.

Printer Project

Californian Jon Glazer lives in a remote area without power, and runs this ZX81 from a car battery and voltage regulator. He is not satisfied with the available printers. Recently he typed us a letter on a Brother EP-20 typewriter powered by four alkaline "D" cell batteries.

"Sears carries an identical machine," he wrote. "It has a 16-character buffer and is thoroughly microchip controlled. Its main drawback is a slow carriage return. It will accept fan-fold paper if I remove the detachable drive strips.

"I am not a designer or engineer. Perhaps a reader might like to create an adaptation that would allow this typewriter to also function as a ZX printer. I happen to be able to provide a wealth of electronic and mechanical technical data and would be pleased to correspond with anyone interested in this project."

Write to John Glazer, P.O. Box 31, Horse Creek CA 96045.

Bulletins

Keyboard Overlay

If you like everything about your T/S,ZX except its original membrane keyboard, and can't afford a new keyboard, why not try a plastic keyboard overlay? The "Contact Lens," a custom-designed overlay made of clear non-glare plastic with rectangular wedge-shaped holes, lets you type faster, stops missed keys, improves accuracy and accommodates even large fingers. Its adhesive backing makes it a cinch to install over the original membrane keyboard. Available for $7.95 from Warren Imports Group, 81 Brookmill Blvd., Unit 80, Agincourt, Ontario Canada M1W 2L5.

Tax Return Help

KSOFT announces that its Tax Return Helper, consisting of five programs to help in filling out Form 1040 and Schedules A, B, C, D and E, will be available in January. Data is directly entered on a screen copy of the form. The programs perform all computations and even detect some of your errors. As in an electronic spreadsheet, when you make a change all the lines affected by it are updated on the spot and Form 1040 and Schedule A are automatically correlated. Cost: $14 for the 16K T/S1000,ZX81; $18 for the T/S2068: both are tax deductible. (Add $1.50 s&h). KSOFT offers a $5 discount for buyers of previous editions. KSOFT, 845 Wellner Rd., Naperville, Il 60540.

Upcoming Events

Nov. 14-17: Canadian Computer Show, Toronto, Ont., Canada
Nov. 15-17: Buffalo Computer & Industrial Tech. Show, Buffalo, NY
Nov. 15-18: Compec, London, England
Nov. 17-20: Computer Showcase Expo, Chicago, IL
Nov. 28-Dec. 2: Comdex/Fall '83, LasVegas, NV
Dec. 6-8: Business Expo, Dallas, TX
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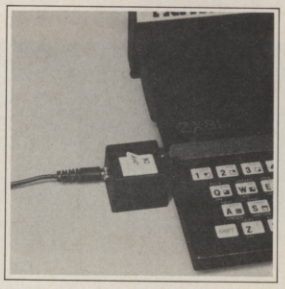

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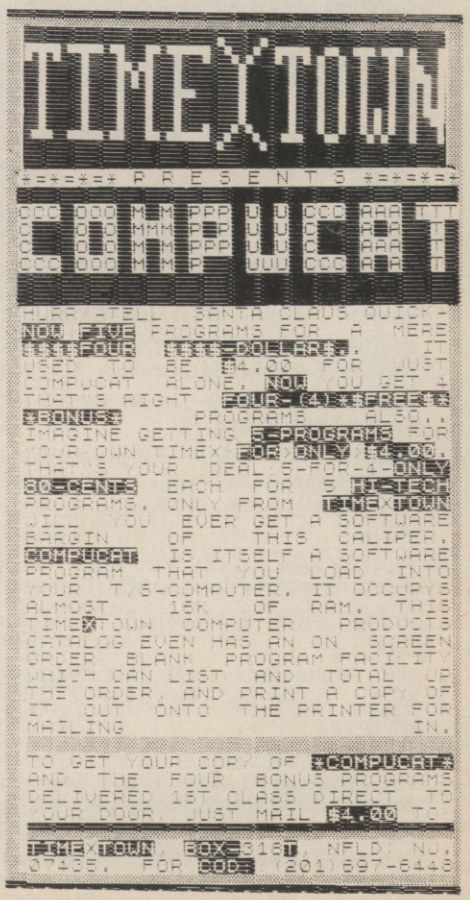
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Introducing the The home computer the question "What

Timex introduces a second generation of home computers designed with one purpose in mind: to be useful.

With 72K on-board memory, it's powerful enough to solve more problems in your home. Entertain you with brilliant color graphics and 8-octave sound.

Plus do word processing as well as spread-sheet functions.

72K on-board memory. More memory than any computer in its class. And more memory means you can do more.

8-octave sound. Can be used to create four sounds simultaneously over a wide frequency range.

Word processing capability. This optional program provides a 64-character wide screen when used with a video monitor. An 80-column printer that provides hard copy will be available in early 1984.

Sleek new compact design. Fits easily on any desk or table.

Raised typewriter keyboard. With full-travel keys is based on world's most popular electronic keyboard design.

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Timex Sinclair 2068. smart enough to answer can I do with it?"

And while it does more, it does it with greater simplicity.

Its one-touch keyboard means you don't have to know typing. New Timex Command Cartridges can be used without any knowledge of programming.

Finally. A home computer you can really use in your home: the Timex Sinclair 2068.

Unique one-touch entry. Requires no typing skills; makes programming easier to learn.

Timex Command Cartridges. Provide faster, easier program loading, take up less storage space.

Robbers Of The Lost Tomb (16K) Recover four tablets hidden in a 100-room multi-level tomb. Age 15 and up. $14.80 (040)

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Slot Machine (16K) Las Vegas-style wagering. Realistic payoffs. Animated graphic display.

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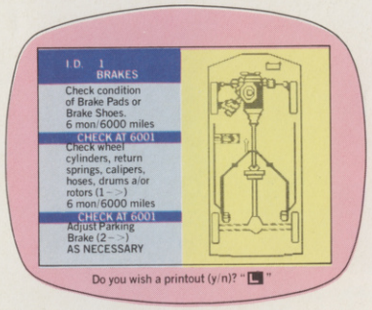
You can diagnose why your car won't start. Or calculate paint for a seven-room house.

The most advanced computer technology in the world won't do you much good unless there is useful programming to go along with it.

And Timex has provided just that.

A series of exciting new software that can help you in business, in your home, in education and entertainment.

Here is just a sample: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BRAKES
Check condition of Brake Pads or Brake Shoes.
6 mon/6000 miles
CHECK AT 6001
Check wheel cylinders, return springs, calipers, hoses, drums a/or rotors (1 -->)
6 mon/6000 miles
CHECK AT 6001
Adjust Parking Brake (2 -->)
AS NECESSARY
Do you wish a printout (y/n)?

Care for your car

Like a good mechanic, this program pinpoints car problems, keeps a record of routine maintenance—and reminds you when service is due.

Habla Español

The simple way to learn a foreign language. Test your translation skills from English to Spanish —and vice versa.

Project IRA interest

How much is your IRA worth today? Next year? At retirement? Now you can find out with computer precision, in an instant.

Plan home improvements

Now you can determine how much you'll really need to paint, wallpaper, or carpet any room in your house.

Drag race

Shift gears and monitor your speedometer and tach as you race over a quarter-mile track against the clock.

Fly a plane

You're in control of a highly maneuverable light plane, ready to do loops and wingovers and avoid hazards as you land.

Improve your spelling

A challenge for your children—and an excellent way for them to learn from their mistakes. It's for beginners and more advanced students.

Study the stars

Even when it's cloudy your children can see the stars, and learn facts about the solar system. And be tested on what they have learned.

Save on a loan

You could go broke "saving" on the wrong loan. This program makes sure you choose the right one by helping you analyze all the less apparent factors.

Analyze solar heating

Will solar heating your home save you money? Is it worth it? This program weighs the merit of different collector designs, and determines the right one for you.

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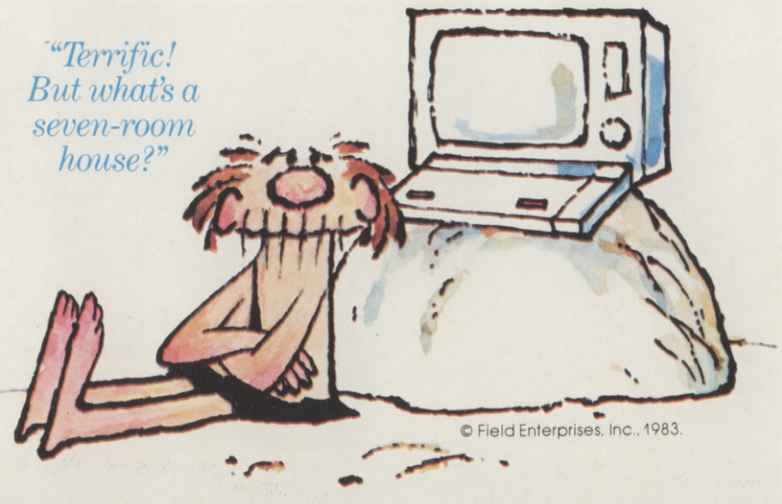
"Terrific! But what's a seven-room house?"



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Imagine pressing a key on your computer and being in touch with the Dow Jones averages.

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The new Timex Sinclair 2090 Command Sticks give you a distinct advantage—the trigger is right where you want it. Sorry about that, Androids.

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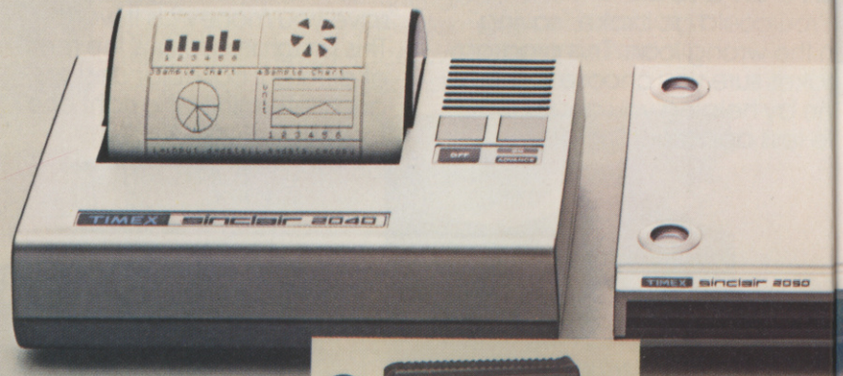
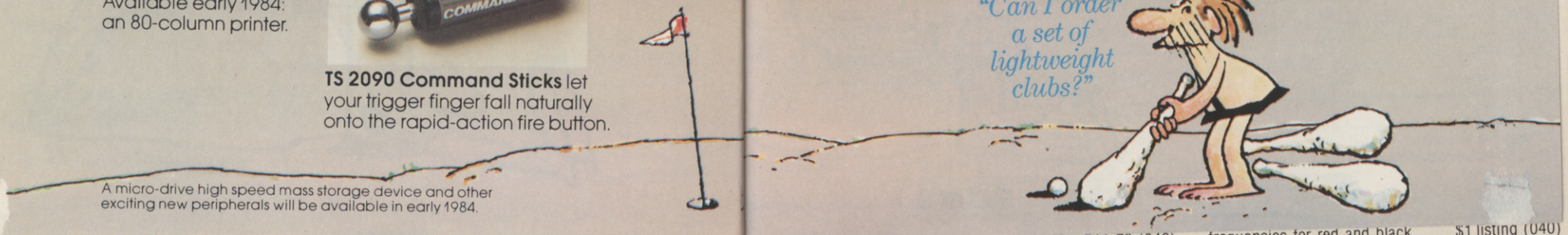


TS 2040 32-Column Thermal Printer— just for the record. Available early 1984: an 80-column printer.

TS 2090 Command Sticks let your trigger finger fall naturally onto the rapid-action fire button.

TS 2050 Modem links you with a new world of opportunities.

TS 2020 Computer Program Recorder makes loading programs foolproof.



A micro-drive high speed mass storage device and other exciting new peripherals will be available in early 1984.

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can before you go into hyperspace. $14.95 (111)

The Invaders (16K) You can fire while moving. All in machine code. $11.90 (040)

Timeblasters (16K) Space battle game features time acceleration on missing shots. Blast a space station to slow it down again. Start with 5 ships. All ages. $12.95 (010)

Winged Avenger (16K) $14.95 (076)

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Z-Trek (16K) Seek and destroy up to 200 Zylons. 24-line display, moving graphics. Some machine code. $9.95 (099)

Zor (16K) Two mighty robots join combat on a barren planet. Can you win as defender of Earth? $14.95 (032)(041)

Zorx Wars (16K or 64K) Your starship battles Zorxian fighters, space cruisers, killer satellites and neutron bombs amid the black holes. All ages. $12.95 + $2 p&h (001)

ZX Froggie (16K) Guide your frog through hazards. Four levels of play. Fast action. $14.95 (041)

ZX Galaxia (16K) Formations of hostile Galaxians attack your ship in deep space. You must protect the Earth with your laser gun. $14.95 (037)(041)

ZX Scramble (16K) Pilot your craft through the space maze. Evade and fire missiles. All machine code. $14.95 (032)(041)

Adventure Games

Adventure 1 (16K) Explore the caves. Find the treasure. $13.50 (040)

#477 Adventure (16K) price on request (040)

Adventure To Korvas (16K) Role-playing game. Map display shows progress as you seek a rare artifact. $14.95 (037)

Alien (16K) Based on the film. You have your choice of weapons as you stalk your quarry around the ship. $14.95 (111)

Alien Intruder/Hieroglyphics (16K) Escape the deserted alien spaceship. Decode the 39-symbol alphabet to make your getaway. $10.60 (040)

Alien Space Ship (16K) Escape aliens in search of humanoid slaves with your pet android, Fred. $14.95 (032)(041)

Antropuss (16K) Travel through the cave, avoiding malicious bats and the man-eating Antropuss. You have only five arrows for self-defence. $9.95 (042)

Around Europe In 80 Hours (16K) Collect souvenirs on your whirlwind tour of Europe to win a wager. $11.95 (032)(041)

Artillery (16K) Given the target range, the user enters initial velocity and angle of elevation. Graphic display, four levels, scoring. $9.95 (042)

Aztec Gold (16K) Encounter mummies and other weird things in the temple of Tikhun in your search for gold. $12.95 (037)

Catacombs (16K) Find the gold before time runs out for you. Unlimited levels. $15.90 (040)

Deathship Sabotage (16K) Stop the deathship before it gets to Earth. $12.95 (037)

Dragon Lair (16K) A strategy-fantasy game. Magic, Wizards, theives, spells, monsters and dragons. Variable difficulty level. Includes guide booklet. $15.95 (087)

72K. COLOR. SOUND. UNDER $200.*

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Star Trek (16K) Clear the galaxy of the Klingon menace. Overcome the hazards of the galactic sectors. $9.95 (042)

Star Trek (16K) Command the Enterprise to destroy Klingons. $10 (040)

Star Trekker (16K) See what a good Trek can be. Based on the adventures of the popular series. $14.95 (111)

Starquest (16K) Run the gauntlet of galactic perils in a search for a New Earth paradise. $14.95 (032)(041)

Subspace Striker (16K) Attack to disrupt

Trap (16K) Catch the bouncing balls. Progressively difficult and fast. $9.95 (080)

Board Games

Backgammon And Dice (16K) Easy to learn, fast and exciting. Chance and skill. All machine code. Graphics of rolling dice and doubling cube. $14.95 (080)

Battleship (16K) Two players, or you and the computer. $7.95 (009)

Battleship (16K) Keep your forces hidden while you try to sink the enemies'. $9.95 (032)(041)

Battleship (16K) Play against the computer. Destroy its fleet. $10.60 (040)

Chess And Chess Clock (16K) Six levels of play. In machine code. All the legal moves. Graphic display. Separate records of plays for easy reference. Switch sides in mid-game. $14.95p (080)